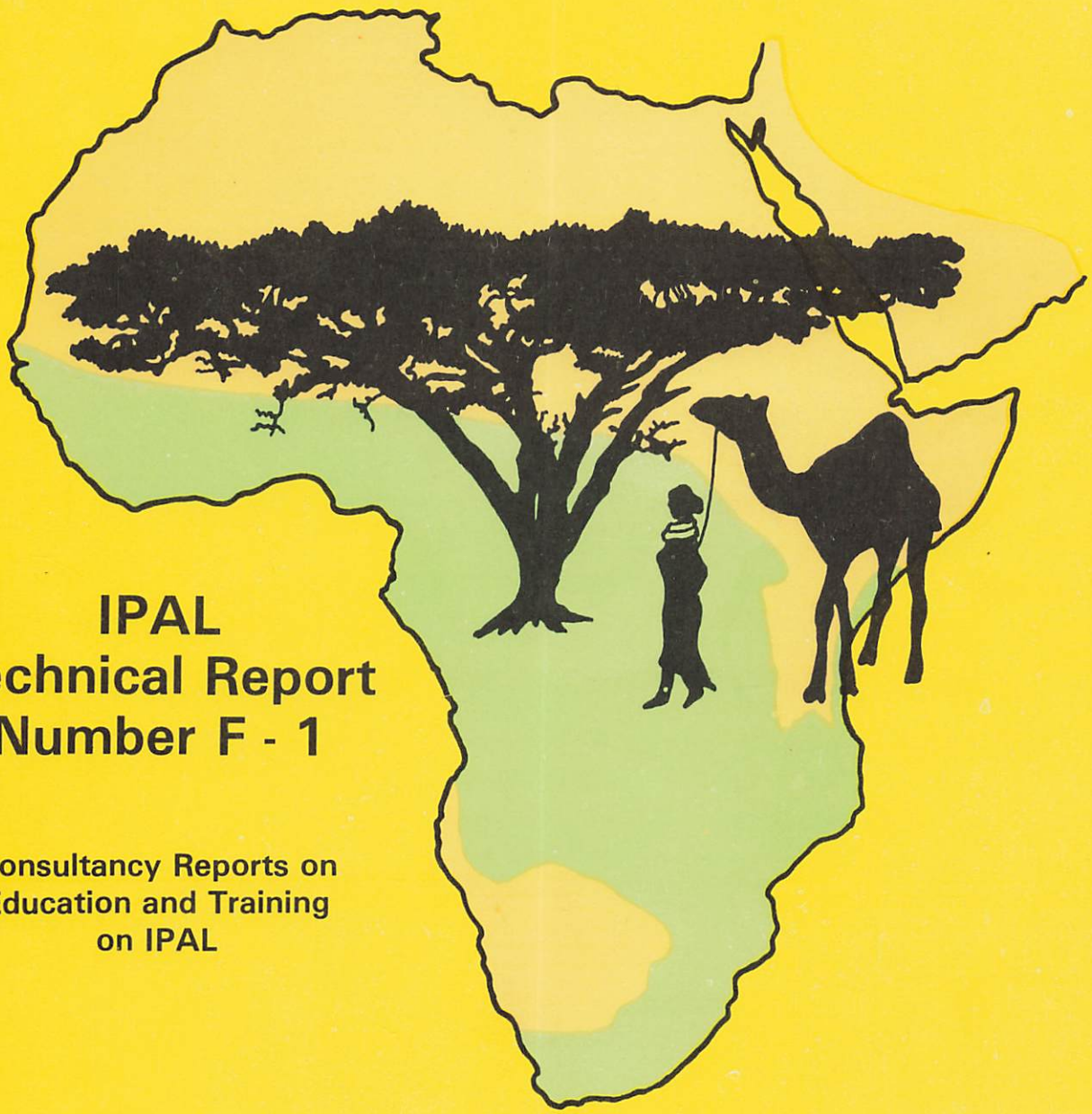
Federal Republic of Germany

Unesco Programme on Man and the Biosphere (MAB)

Republic of Kenya

Integrated Project in Arid Lands (IPAL)



IPAL Technical Report Number F - 1

Consultancy Reports on Education and Training on IPAL

MAN AND THE BIOSPHERE PROGRAMME

Project 3: Impact of Human Activities and Land Use Practices on Grazing Lands

IPAL Technical Report F.I

REPORT OF A CONSULTANCY IN EDUCATION AND TRAINING

by
Irma A. Allen

November, 1981

UNEP-MAB Intergrated Project in Arid Lands

SUMMARY INTRODUCTION TO IPAL AND THE TECHNICAL REPORT SERIES

The Integrated Project in Arid Lands (IPAL) was established by UNESCO with financial support from UNEP in 1976 with the aim of finding direct solutions to the most urgent environmental problems associated with desert encroachment and ecological degradation of arid lands. It forms part of the international UNESCO programme, Man and the Biosphere (MAB) which has links not only with UNEP's Desertification Unit but also with FAO, in response to the Plan of Action adopted by the 1977 United Nations Conference on Desertification. It is an example of the type of pilot activity that UNESCO and UNEP, together with other organizations and a number of governments, are trying to promote to provide the scientific basis for the rehabilitation and rational management of arid and semi-arid zone ecosystems, through integrated programmes of research (including survey, observation and experimentation), training and demonstration. Phase III of the Project, 1980 - 1983, is supported by funds in trust to UNESCO provided by the Federal Republic of Germany.

During the first phases of IPAL, a co-ordination unit was established in Nairobi and the initial field work started in the arid zone of northern Kenya in a working area of 22,500 km^2 situated between Lake Turkana and Marsabit Mountain. The project now operates five field stations at Mount Kulal, Olturot, Kargi, Korr and Ngurunit, with the project headquarters in Marsabit which is the administrative centre of the District. Since its establishment the project has researched several aspects of experimental management of the region, concentrating upon 'human ecology' of the nomadic pastoralists in dynamic inter-relationship with the animals, plants and the other resources of a drought-prone, uncertain environment.

During the next three years (1980-1983), the investigations in progress will be extended and intensified to develop resource management plans or models for the area, taking into account the increasing human population, the trend towards sedentarization, the degradation of primary productivity, and the increasing incidence of soil erosion, all of which are factors resulting in the necessity for constant famine relief measures in this region. Results obtained in the project are the subject of a number of training workshops and seminars in which Kenyan and regional scientists from the Sudano-Sahelian region participate.

This report is one of a series published by IPAL describing technical findings of the Project and, where appropriate, giving management recommendations relating to the central problems of ecological degradation in the arid zone. The reports are divided into the following categories distinguished by the base colours of their covers:

A. general, introductory and historical: white

B. climate and hydrology: blue

C. geology, geomorphology and soils: brown

D. vegetation: green

E. livestock and other animal life: red

F. social and anthropological: yellow

CONTENTS

Introduction

The problem 15
IPAL educational objectives 15
Aims of the consultancy 16
Methods of study 17
IPAL resource utilization 17
Review of literature 17
Discussions with local people and government officials 17
Interviews 17
Observation 18
Visits to study area 18
The study area 19
Location 19
The people and their herds 20
Education in the area 22
Historical background 22
The present school system 26
Primary education 26
Secondary education 29
Constraints to formal education of the nomadic communities in northern Kenya 30
Parents 30
Teachers 30
Boarding schools 30
Curriculum 31
Facilities 31
IPAL and environmental education 32
Integrating project results into educational curricula 32
Environmental management and environmental education 34
IPAL activities to date in environmental education 35

Public relations extension programme 35
Demonstrations 36
Inservice training for field assistants 38
Graduate student programme 38
Seminars and workshops 38
Dissemination of research reports and article 38
Communication and curriculum planning 39
Institutions and agencies concerned with the environment 39
The National Environment Secretariat 39
Agricultural colleges 40
Sang'alo Institute of Science and Technology 40
Bukura Institute of Agriculture 41
Embu Institute of Agriculture 41
Egerton College 42
The University of Nairobi 43
Undergraduate programmes 44
Post graduate programme 45
The School of Environmental Studies 46
Kenyatta University College 47
The Kenya Institute of Education 48
The Kenya Institute of Administration 49
Primary Teachers' Colleges 51
Primary schools 52
Secondary schools 54
Adult education institutions 55
Kenya Science Teachers' College 56
The Polytechnic Colleges 56
Communication 58
Communication and environmental education 58
Infrastructure for communication in Kenya 59
Communication in the study area 60
Telephone 60
Television 61
Press 61
Posters and circulars 62
Cinema 62

Radio broadcasting 63
Barazas 65
Advertising 69
Two-way radio 70
Interpersonal communication 71
Extension services and rural communication services 72
Rendille radio programmes: a test case 75
Rationale 75
Objectives 75
Approach 76
Operational generalizations 76
Physical arrangements 78
Programme 80
Formative evaluation 81
Summative evaluation 86
Educational materials 96
Development of educational materials 96
Radio programmes for schools 96
Taped talks for slide/tape presentations 96
IPAL brochure 97
Participation in development of an environmental education resource centre 97
Conclusions and recommendations 100
Education 100
Recommendations re education 100
Public relations 101
Recommendations re public relations 102
Communications 102
Recommendations re communications 103
Acknowledgements 105
References 106

Appendix I
Educational Statistics from Central Bureau of Statistics 110
Appendix II
Recommendations with Educational Implications from IPAL Technical Reports 116
Appendix III
References in Development Plan 1979-1983, Part I About Educational Policies and Management of Arid Lands 117
Appendix IV
Estimates of Recurrent Expenditure on Education and Training by all Ministries 1976/1977 118
Appendix V
Sample of One Radio Programme 119
Appendix VI
Evaluation Form for Radio Programmes 122
Appendix VII
Interview Schedule 123
Appendix VIII
Suggested Framework for Next Phase of IPAL Education, Training and Public Relations Work 125

Tables

Enrolment in Primary Schools By Sex in Marsabit District 1977 26

Primary Schools in Marsabit District, 1981 27

Locations of Chiefs, Assistant Chiefs (Baraza Sites) in Marsabit District 67

Location of IPAL radios and number of listeners 82

Comments of Listeners 85

Comments of Assistants 86

Educational Composition of Samples 87

Figures

Location of Study Area 23

The Study Area 24

Factors Leading to Desertification in Northern Kenya 25

Advertising Expenditure by Medium, Kenya 1976 69

The Communication Process 74

How the Proposed Resource Centre can Help Link Existing Resources 98

SUMMARY

This report presents the results of a six month investigation of possible communication and educational channels which may be used for the integration of project scientific findings with non-formal and formal education activities in Kenya.

In general, communication presents a challenge. On a national level, the greatest constraints to available media are: the approximately 60% illiteracy rate in the country; the many vernacular languages people speak for which one must cater; an urban-based, largely urban-oriented press; lack of co-ordination between existing media services and 'communicators', and insufficient training in communications for those concerned.

In addition to these constraints, additional ones in the IPAL study area are: insufficient media; limited extension services; poor quality of transportation and radio services; and an even higher illiteracy rate than the national average.

Evaluation results of a test case in the study area to assess the effectiveness of radio as a means of communication with Rendille nomadic pastoralists indicate that this medium, with certain modification, has a good potential for future education endeavours in the study area. The programmes were quite successful and quantitative data shows that real gains were made in five out of the six main objectives.

On-going evaluation of each radio programme provided valuable insight into people's perceptions, values, and communication approaches.

The study identified many existing educational channels which can be utilized, and whose own programmes would be strengthened by scientific input from the project. First, there is an extensive formal system which embraces primary, secondary, higher, technical, and special education. In addition, there are many educational projects and services which are being sponsored by non-governmental organizations, international agencies, harambee efforts, and others. These are discussed in the report, or references given. Recommendations are made for ways and means of integrating IPAL's findings with current curricula and activities of the existing educational institutions, at different levels.

INTRODUCTION

The problem

"One of the biggest problems in a developing country like Kenya is that research information does not reach the people who really need it. It tends to be concentrated among the educated and urbanized communities in relation to the modern sector of the economy. While this is desirable, the great majority of people living in the rural areas receive little because knowledge is not adequately translated and transferred in a form that can be used by them. This in fact remains one of the biggest challenges to scientific work". (Mungai, 1978).

This is a challenge facing IPAL, for in order that its research into desertification and arid land ecology have long term value, it must help promote the development of the people among whom it is applied, the nomadic pastoralists, and others.

Cognizant of this fact, IPAL has studied traditional practices, with a view to integrating them with scientific research findings. Project scientists have worked closely with the people with whom they come in contact in the study area, and with other institutions in Kenya.

The work of this consultancy represented a step in facilitating a constant flow of information about the environment from the scientists to the people and vice versa. This can be called "environmental education".

IPAL educational objectives

The specific IPAL objectives are outlined in the project document. While the Project has been and still is primarily a scientific investigation, the present phase is more action oriented, with emphais on human ecology and on education and training. Some of the revised long term objectives for this phase which have educational implications are:

- To elucidate the mechanisms of recovery of soils, vegetation, and animal life in arid and semi-arid regions, to evolve guideline

for the rehabilitation of, and the restoration of the sustained productivity of arid areas; to study the interactions of the vegetation with all forms of animal life, specially domestic livestock; to provide simple demonstrations of the results of ecologically oriented management of arid zone ecosystems.

- To carry out training and orientation in arid zone ecology and management at the professional and technical levels.
- To provide education at several levels in arid zone ecology and management.
- To provide the programme basis for the establishment of an institution in Marsabit District for continued research, monitoring, and training relevant to the management of resources in the arid zone.

Among the short term objectives of Phase III which have educational implications are:

- To support and encourage the training of experts in arid zone research, resource management and rehabilitation specially in developing countries, and to help in the development of local expertise.
- Support extension officers in the district by providing them with some of the information they need for their extension programmes, and to assist in the organization of orientation seminars in arid zone ecology at all levels.

Aims of the consultancy in education and training

The aims of the consultancy, as defined in the terms of reference, were:

(a) To investigate how Project results can be incorporated into the present educational curricula in Kenya.

(b) To evaluate the effectiveness of present communication media to determine the most effective means of reaching the pastoral nomads of northern Kenya.

(c) In order to investigate the most effective way of disseminating Project results to the largely illiterate local population, and using the Project as a test case, to design a radio programme of 15 minutes to be transmitted twice a week on the

Voice of Kenya in the Rendille language, and later evaluate the success of such an experiment.

(d) To make a brochure on the project's objectives, functioning and expected results.

(e) To start to design material for the proposed seminars at different levels.

Methods of study

Different methods of study were used to achieve the various tasks of the consultancy.

1. IPAL resource utilization

The IPAL Technical reports were reviewed to provide a picture of the study area and of the various investigations. Consultations were held with each of the project specialists regarding their investigations and findings, their interactions with the pastoralists, and specifically on the educational implications of their work.

2. Review of the literature

There is still relatively little information on education and communication in the study area. The literature reviewed could be classed under the following categories:

(a) studies of the people and conditions in the area by social anthropologists and biologists.

(b) Kenya development and education policies and plans through government publications e.g. Annual Reports, and circulars.

(c) environmental education, particularly in Africa and Kenya.

(d) communication policies and methods, particularly in Kenya.

(e) catalogues and syllabi of educational institutions in Kenya.

3. Discussions with local people and government officials

Informal discussions were held with pastoralists, IPAL employees, teachers and headmasters, missionaries, chiefs and councillors in the study area, and with government officials at Marsabit and Nairobi.

4. Interviews

In order to evaluate the radio programmes designed to assess the effectiveness of radio as a means of communication with the

pastoralists, an interview schedule was designed, tested and used to carry out structured interviews with Rendille people in the study area, both before and after the radio programmes.

5. Observation

Visits to schools in the study area were made, and observation made on teacher-pupil interaction and school activities.

6. Visits to study area

Visits were made to the study area for the following purposes:

(a) obtain general orientation on the area and project;

(b) carry out survey of communication and education facilities in the area, and consultation with project scientists;

(c) test the interview schedule, conduct interviews, train assistants, determine the locations for placement of radios in manyattas, and record interviews and sound effects to be used in the radio programmes;

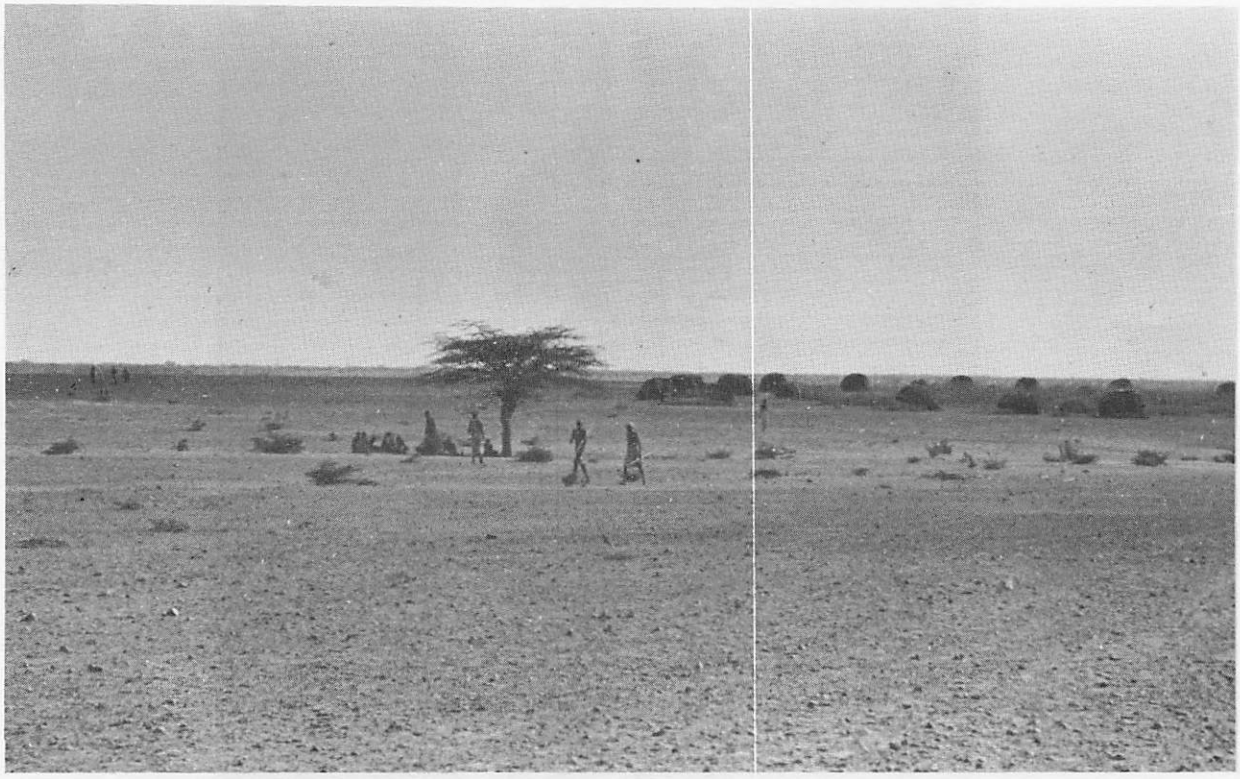
(d) monitor the programmes, brief field assistants and conduct post-radio programmes interviews for summative evaluation.

THE STUDY AREA

Location

The study area is in the arid zone of northern Kenya and consists of 22,500 km^2 located in the west of Marsabit District in the Eastern Province of Kenya. The site was selected to be sufficiently large to be representative, and to cover the major biotic communities found in the area, where major processes leading to desertification can be observed and studied directly. (Fig .1)

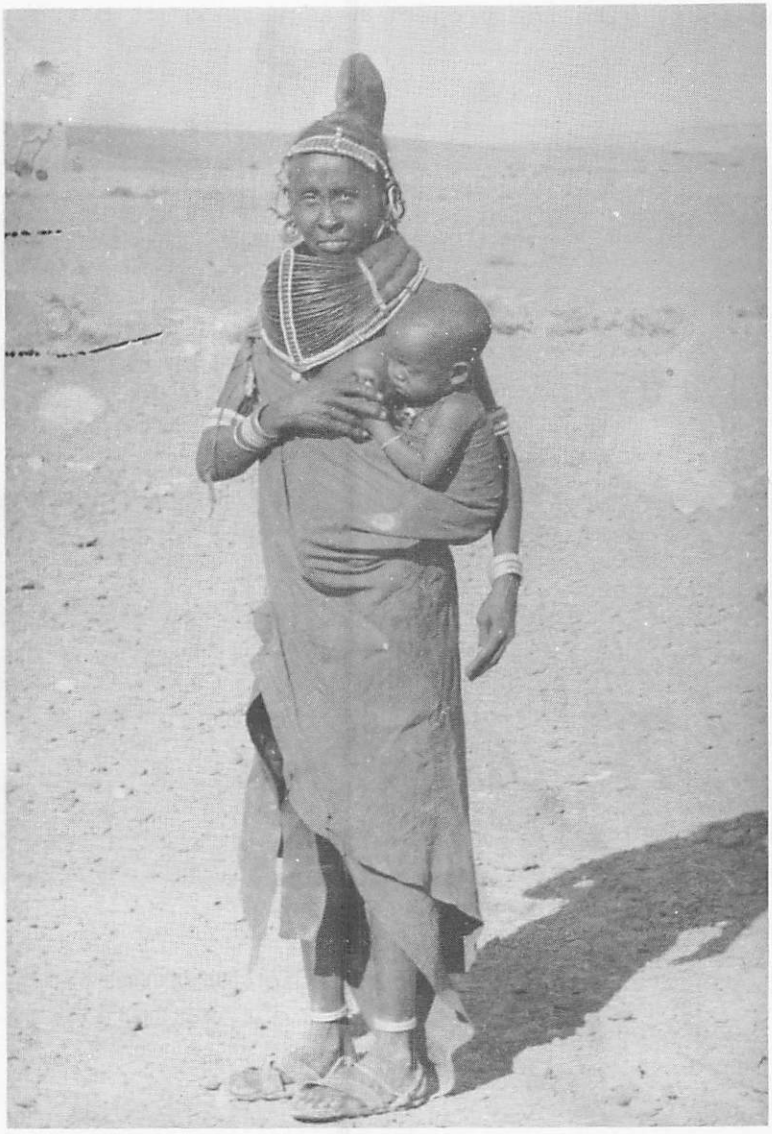
There are five field stations located at Gatab, Olturot, Kargi, Ngurunit and Korr, with the project headquarters at Marsabit. (Fig. 2)



Part of a settlement of Rendille nomadic pastoralists showing population pressure and lone tree, Kargi, August, 1981.

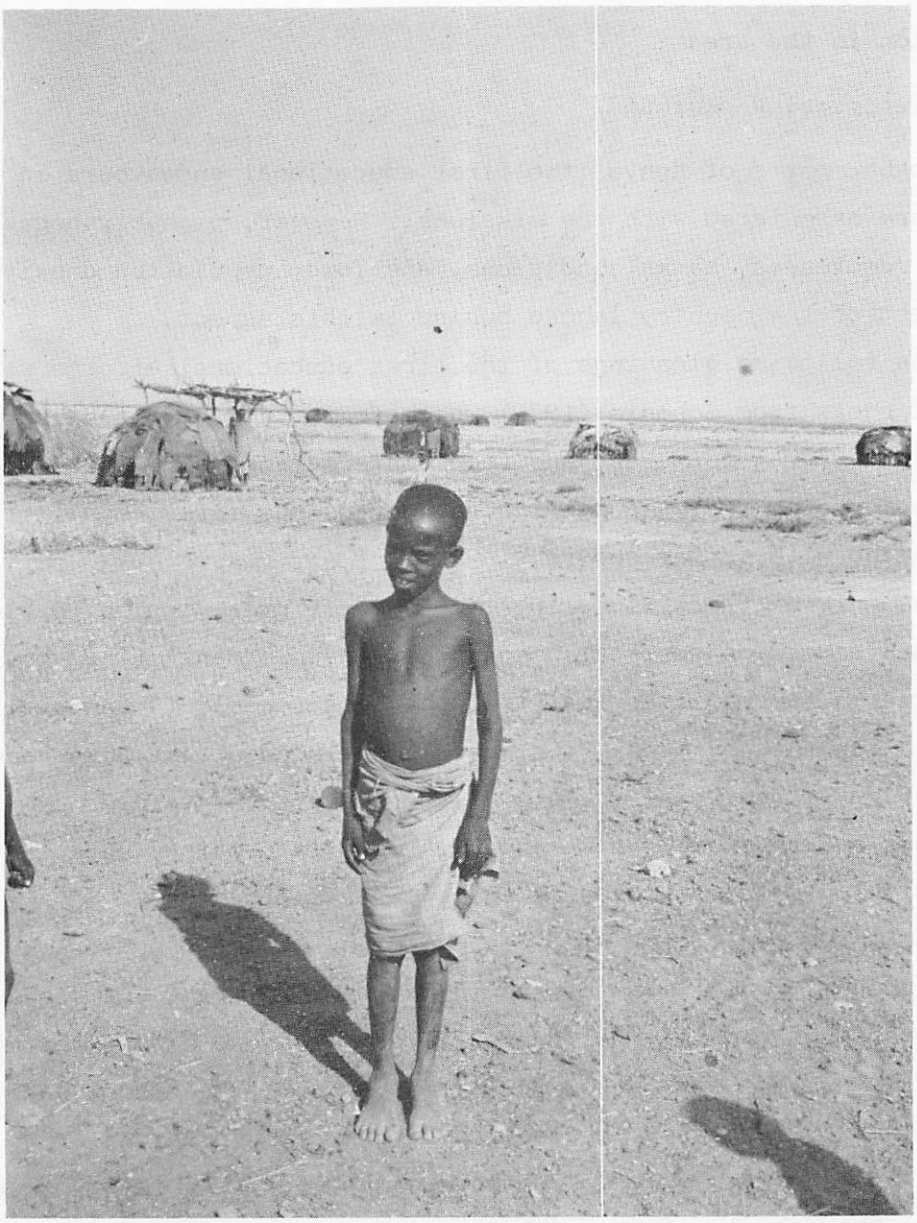
The people and their herds

The greater part of the Rendille tribe and a large part of the Gabbra live in the study area, occupying the south and north parts, respectively. Both these people are nomadic pastoralists who keep camels, sheep and goats. Small numbers of Boran and Samburu occupy the mountainous fringes of the study area. They are basically cattle-keeping nomadic pastoralists. As a rule, the different tribes do not use the same geographic areas because of antagonism and fear of inter-tribal raiding of stock. The mainstay of their diet is milk from camels or cattle and the meat of small stock (Field, 1979).



Rendille mother and her child

The 1969 census showed that the human population in the study area is about 30,000, or approximately one person per km^2. Unfortunately, the population is not evenly spread. Some areas are largely unpopulated, whereas others, usually around a few springs and boreholes, attract people, along with their herds. Apart from water, these centres offer shops, medical facilities, schools, famine relief, and probably most important, they offer security from inter-tribal raiding.



Rendille boy from Kargi

Lamprey (1981) states that the overall density of livestock in the study area (as determined by aerial surveys) is 4.6 Tropical Livestock Units (TLU) per square kilometre. (1TLU=250 kg liveweight) but that around the settlements, the density may be as high as 25 TLU/km^2. There are 12 of these settlements which, with such high livestock densities, have become the centres of ever-widening circles of denuded land. Fig. 2 illustrates some of the factors which are leading to this process of desertification.

Education in the area

1. Historical background

As in other parts of Kenya, the first educational endeavours in this area were associated with the missions. However, probably because of its remoteness, harsh conditions, and lower population density, this part of the country lagged behind in this aspect.

The following gleanings of the first educational efforts were taken largely from Sobania (1979) who made a study of the history of the study area for IPAL, and from conversations with local people such as former chief Lago Ogom, a founder of the first Rendille School, and with former pupils.

The only District School by 1938 was run by a mission (Bible Churchman's Mission Society), and it had an enrolment of "32 boys and girls in the register and 21 at the Boma School" (Sobania, 1979, p. 145). In the next year, the school consisted of 40% Boran and the rest Burji and Somali. In 1940, war conditions forced Europeans at the mission to abandon it, and it remained unsupervised with only one teacher trying to carry on.

The first school for Rendille children, called the Local Native Council School, was set up in Marsabit in 1946. It was a small boarding school for eleven children, with one Maasai teacher. According to Lago Ogom, a founder of the school, the school was established for orphaned or needy children, and the parent or parents were given a goat to compensate them for the "loss" of their child to the school. A tax of ten shillings for every animal sold by Rendille was levied to pay for the running of the school.

Figure. 1 Location of study area

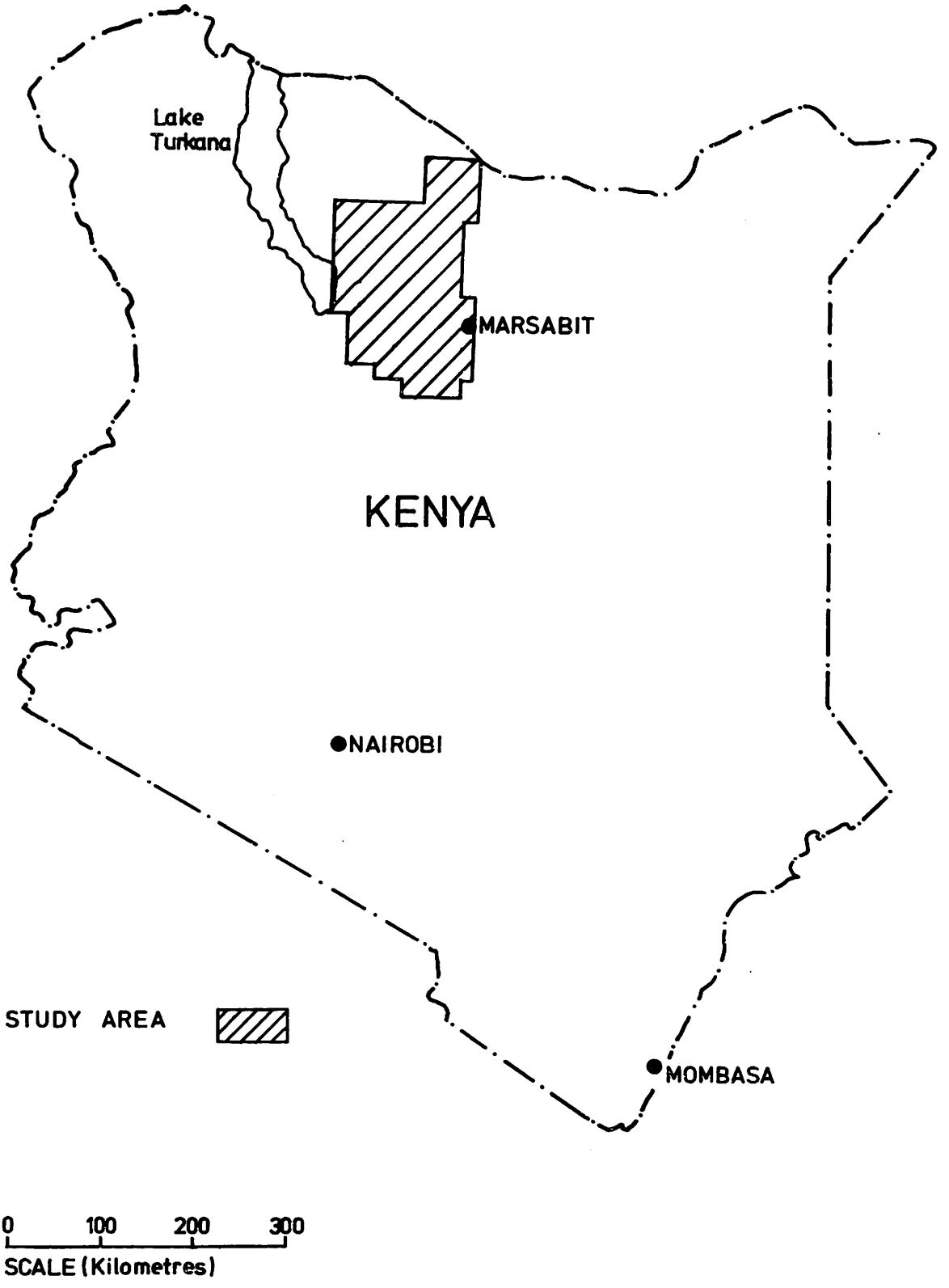


Figure. 2 **The study area**

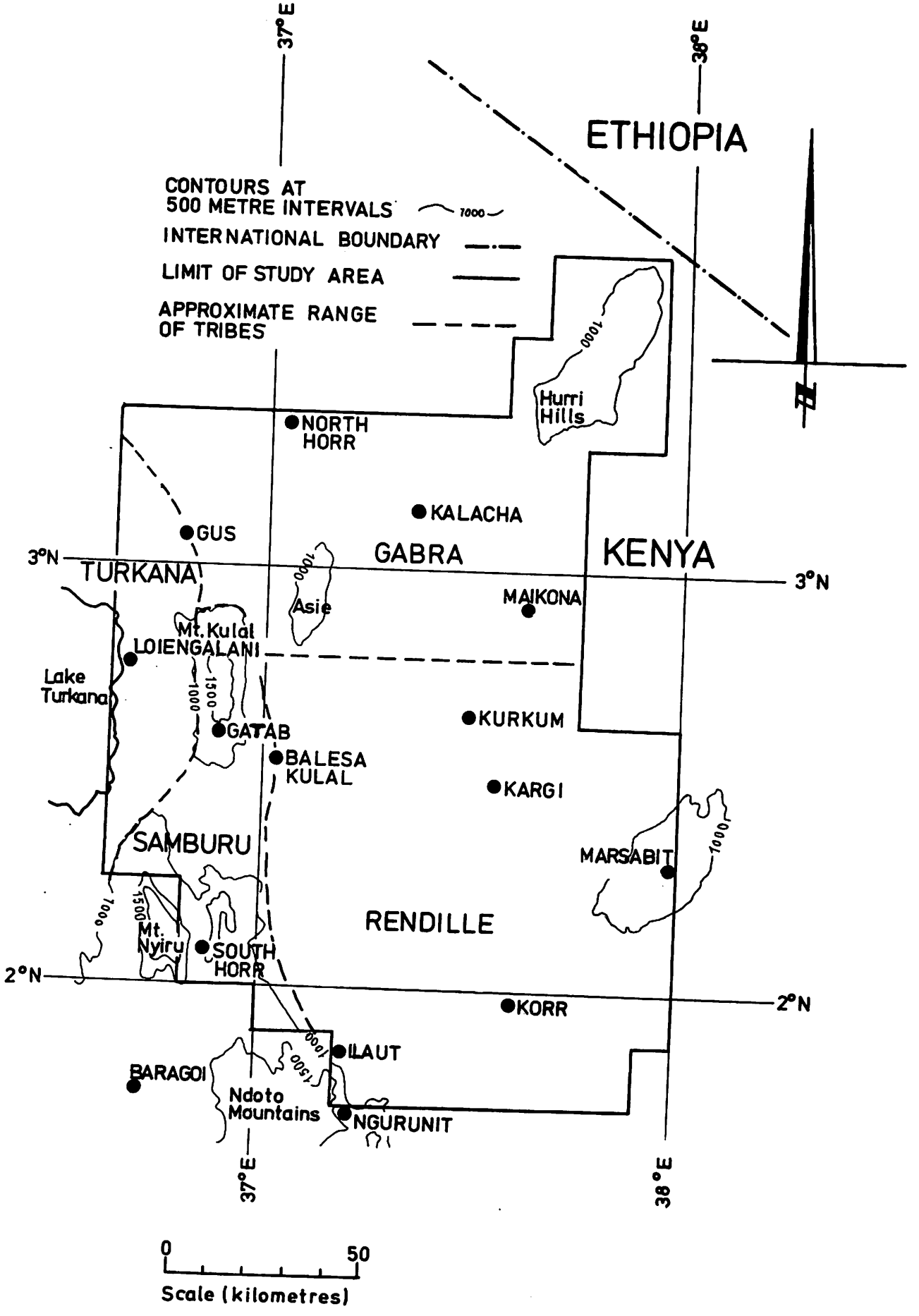
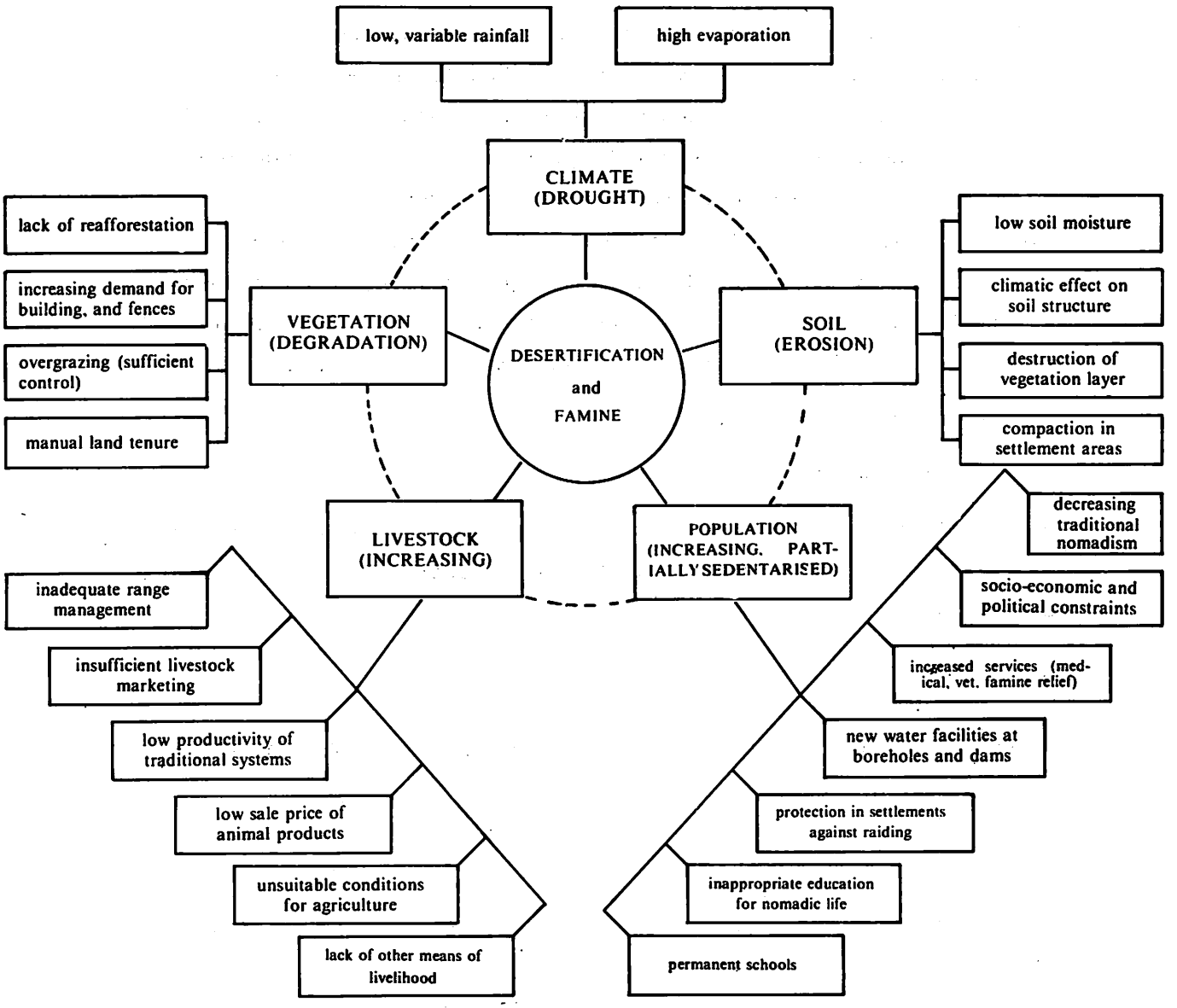


Figure 3

Factors Leading to Desertification in Northern Kenya



(Incidentally, the present member of parliament for Marsabit District North, the Assistant Minister for the Environment and Natural Resources, was one of those eleven children. He was an orphan.)

By 1948, the enrolment at the Local Native Council School had increased by one, and there were twelve pupils in the first two standards. By 1950, there were thirty children boarding there. At that time, the Mission School had about 45 students in Standard I to IV, and they were being taught in Boran and English.

In 1951, the Local Native Council School's operating costs of four hundred pounds was exceeding the revenue and it voted itself out of existence at the Provincial Commissioner's recommendation. The government had agreed to take the school over. (Sobania, op.cit.) Several years later it became a full primary school.

The primary school at Moyale was begun in 1954, and the next was started at Sololo in 1962. Thus there were only three full primary schools in the district at the time of independence.

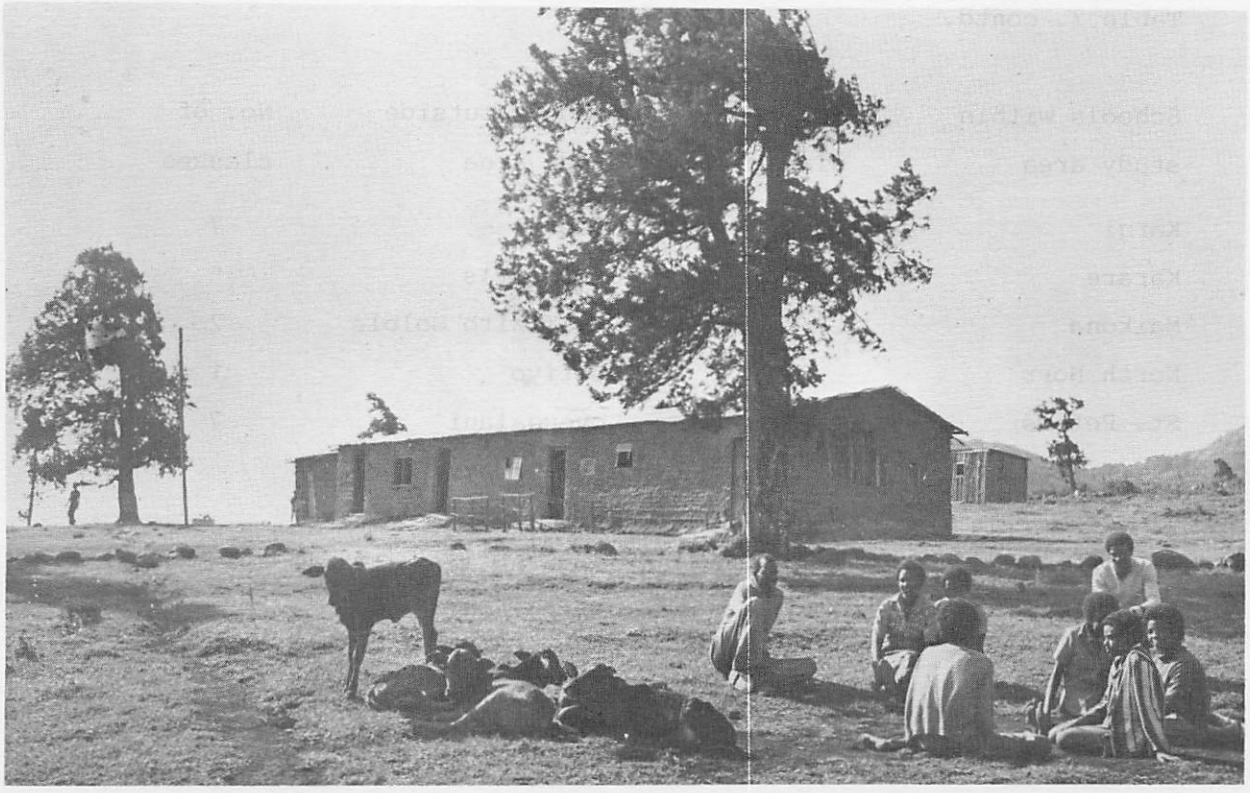
2. The present school system

(a) Primary education

The latest published Annual Report of the Ministry of Education in 1977 listed 22 primary schools in Marsabit District. The enrolment was as follows:

Table 1. Enrolment in primary schools by sex in Marsabit District, 1977

	Male	Female	Total
Marsabit District	3,207	1,325	4,532
National Total	1,587,420	1,387,429	2,974,849



Gatab primary school, 1981

In 1979, the primary school enrolment was 5,355 in Marsabit District (Appendix I). There were 21 primary schools (Rep. of Kenya 1979).

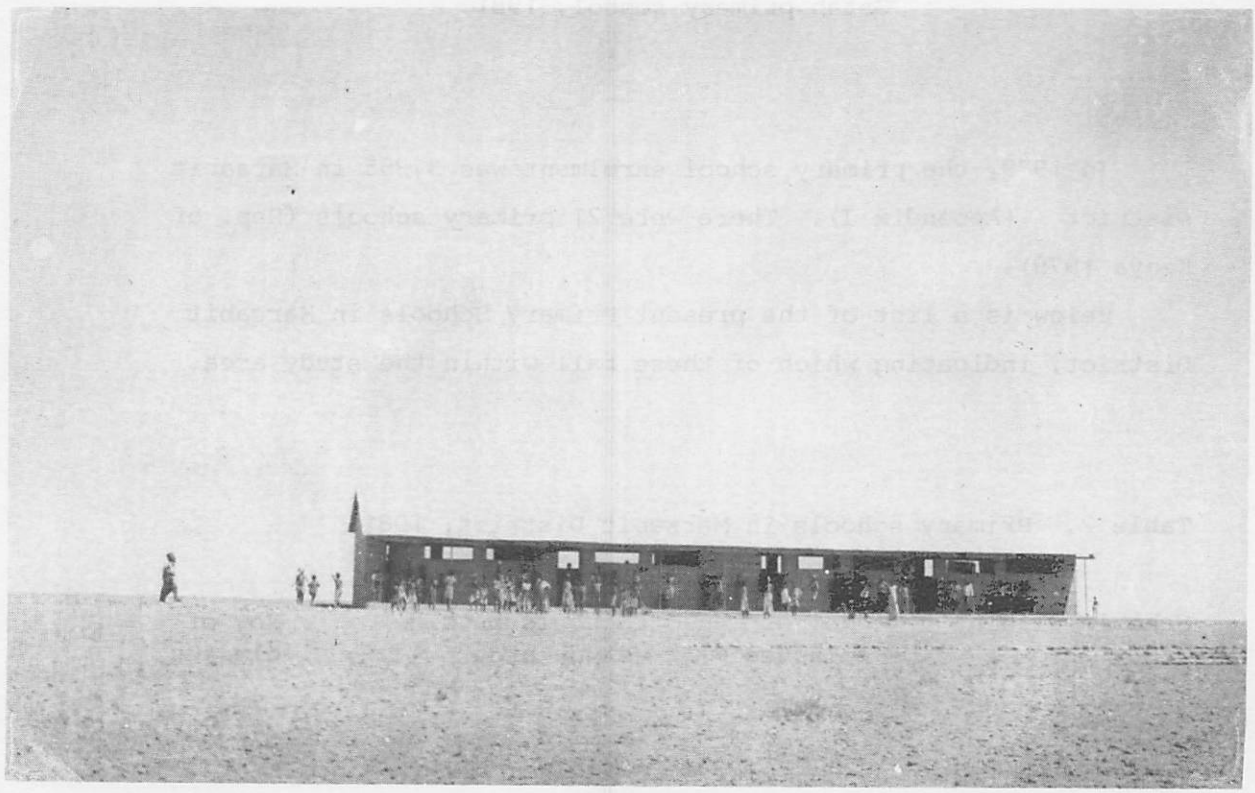
Below is a list of the present Primary Schools in Marsabit District, indicating which of these fall within the study area.

Table 2. Primary schools in Marsabit District, 1981

Schools within study area	No. of classes	Schools outside study area	No. of classes
Marsabit	7	Moyale	7
Laisamis	"	Sololo	"
Logologo	"	Dabel	"
Songa	"	Uran	"
Gatab A.I.M.	"	Damballa Fachana	"

Table 2. contd.

Schools within study area	No. of classes	Schools outside study area	No. of classes
Kargi	4	Godoma	7
Karare	"	St. Mary's	"
Maikona	"	St. Kizito Golole	2
North Horr	7	Buttiye	1
St. Peters	"	Loyengalani	7
C.C.M. Sagante	5		
Ileret	4		
St. Theresas	7		
Sakuu	1		
Korr	1		
S.K.M.	7		



Primary school in Kargi, 1981

The curriculum which is being followed is the common curriculum for all primary schools in Kenya, which was developed at the Kenya Institute of Education. At the end of seven years, the pupils write an examination for the Kenya Certificate of Primary Education. (It is envisaged that there will be a 9 year basic education programme instituted by 1983.)

Visits to some of the schools in the area showed that generally the schools are simply built and the facilities are limited. There was little evidence of attempts to decorate or enhance the classrooms with posters or pupils' work. The teachers generally came from places outside the district. Hostel facilities are often provided by Missions, and most of the pupils, since they come from nomadic families, are boarders.

(b) Secondary education

The Annual Report for the Ministry of Education, 1977 lists two secondary schools in Marsabit District, with a total enrolment of 227 pupils of which 224 were males and 3 only were females. There were a total of 7 secondary education teachers (4 graduates and 3 with SI qualifications). In 1979 in Marsabit District, a total of 125 pupils (86 boys and 39 girls) got places in secondary school (33% of the total candidates who sat for C.P.E.).
"For the first time boys with as many as 26 points could not get secondary school places while in 1978 all boys with 23 points and above got places. The local people have not realized a need for more secondary schools in the district as a result" (Republic of Kenya, 1979 p. 39).

Currently, there are still 2 secondary schools in Marsabit District - Moyale, with approximately 120 students and Marsabit, within the study area, with approximately 320 students.

The secondary school curriculum is the same one followed througnout Kenya, developed by the Kenya Institute of Education in conjunction with the National Examinations Council. The students write examinations for the Kenya Certificate of Education.

3. Constraints to formal education of the nomadic communities in northern Kenya.

Parents

Initially parents had to be offered an incentive for them to allow children to go to school. Then through orders of District Commissioners via the chiefs, parents were coherced into sending some of their children to school (under threat of confiscation of cattle). This has not created a positive attitude towards sending children to schools. Primarily children are an asset to nomadic people who subsist on their herds, for they provide necessary labour. In addition, sending a child to school requires parents to pay boarding fees. The current fee of Kshs. 60 per term, for government hostels, though quite reasonable, nevertheless is an economic burden to many families. Thus, many parents are still not willing to send their children to school.

Teachers

Because there are only a few local people who have been trained as teachers, there is a need to bring in teachers from outside the district. Some of these teachers are sent to these hardship areas against their wish; in some cases even as a type of "punishment" for some infraction. There are communication and cultural problems, as most of these "imported" teachers cannot speak the vernacular languages in the area, and they are used to different diets, recreation etc. The remoteness of the area keeps them cut off for long periods of time from the rest of their families. This creates problems.

Boarding schools

Because of the nomadic life-style of the people, boarding schools are a necessity of permanent schools. Here, the pupils receive health services, an opportunity to mix with others from different ethnic groups, and in most cases, better clothing, food and accommodation than they get at home. Nevertheless, informal discussions with people in the study area and with pupils themselves brought out some

distinct perceived disadvantages:

(a) the boarding school is a foreign environment.

(b) missionaries use them to propagate their faith, and this may cause pupils to abandon their traditional practices that cement their society.

(c) the more comfortable conditions of boarding schools destroy the adaptability of living in harsher conditions.

(d) their cost places a burden, especially on those families who do not have small stock to sell.

(e) away from parents and teachers' influence, children sometimes pick up bad habits such as smoking and drinking, and there is a risk that girls may get pregnant.

Curriculum

The major criticism about the curriculum as it now exists is that it does not prepare the pupils for a nomadic pastoralist lifestyle. In fact, the opposite happens. The parents claim that children develop different values and no longer want to care for animals. Going to school makes them aspire to jobs in towns and to choose a different lifestyle from that of their parents.

A lot of the curriculum content, dealing with agriculture, mining and other features not found in arid lands needs to be introduced differently or replaced, in some cases, with more relevant topics.

Facilities

The building of permanent facilities similar to those built in more temperate climates is inappropriate in several respects. For example, tin roofs in very arid areas such as Korr and Kargi make for unbearably hot conditions inside.

Different sport facilities need to be developed. Playing fields which are bare and rocky do not land themselves to recommended field sports in the area.

IPAL AND ENVIRONMENTAL EDUCATION

Integrating project results in educational curricula

In investigating how project results can be incorporated into the present educational curricula in Kenya, answers to the following questions were sought:

(a) What project results are appropriate for inclusion in educational and training programmes?

The IPAL Technical Reports are good sources of possible educational and training material. The problems studied, scientific techniques used, and results are particularly appropriate for educational programmes at a secondary and tertiary level. A review of the Technical Reports was made to pick up specific suggestions or findings with possible educational implications. These are presented in Appendix II.

At primary education level, simple concepts on arid land ecology and desertification should provide the basis for development of instructional materials.

(b) What are the educational policies in Kenya, particularly with respect to environmental education?

These are specifically discussed in the Report of the National Committee on Education Objectives and Policies (Republic of Kenya, 1976) and in the Development Plan 1979-1983. Briefly, there is keen interest in promoting environmental education, in making the curriculum more relevant, and in seeking more meaningful education for the arid and semi-arid areas. The policy is not to establish separate environmental education classes, but to use an inter-disciplinary approach.

(c) Which National Development Plans have implications for environmental education and management of arid lands?

A review of the Development Plan, 1979-1983, identified many specific points which must be taken into consideration in the development of any educational programmes, particularly with respect to the arid lands. (Republic of Kenya, 1979b). Reference numbers of these are listed in Appendix III.

Specially important to note is that the government is committed to a policy of sedentarisation of nomadic people.

(d) What are the channels through which suggestions for curriculum changes are made?

The Kenya Institute of Education is the curriculum-development arm of the Ministry of Education. Therefore, it must be approached regarding any curriculum matters concerning pre-primary, primary, special, secondary teacher, technical, and adult education programmes. Some institutions (see page 32 of this report) fall under other ministries, in which case the relevant ministries must be approached. Others, e.g. University can be contacted directly.

(e) To what extent have project findings already been integrated?

This is discussed under IPAL activities, page 28 of this report.

(f) What communication channels are available for exchange of information?

These are reviewed under the title "Infrastructure for Communication in Kenya", page 52 through 67 and also at page 90 to 92 of this report.

(g) At what levels should project input be made?

Research into the literature, and into Kenyan educational policies reveals a repeated calling for environmental education input at all levels.

The Tbilisi Declaration in 1977, emphasized this point as follows:

"Environmental education should be provided for all ages at all levels and in both formal and non-formal education. The mass media have a great responsibility to make their immense resources available for this educational mission ....."

(h) What educational institutions are there in Kenya concerned with the environment?

A list of those identified during this investigation is provided starting at page 32 of this report.

(i) What materials are needed to support environmental education efforts, specially with regards to desertification and arid-land ecology?

This is discussed in chapters starting on pages 25, 51 and 89 of this report.

Environmental management and environmental education

At the Tbilisi Conference, the following points emerged which emphasize the need for environmental education as a prerequisite to sound environmental management (UNESCO, 1977c p. 16):

"Concrete results in terms of adoption of environmentally-sound alternatives in the development process cannot, however, be achieved unless the environmental dimension is effectively integrated in thinking and decision-making at various levels of human activities. This latter, of course, is an extremely complex and challenging task, requiring sustained commitment and effort. Information dissemination, technical assistance, environmental education and training and environmental legislation are some of the main instruments which should help bring about environmentally-prudent management of human activities-"environmental management", for short-everywhere".

"Environmental education introduced in the mainstream of education can systematically promote environmental awareness in the younger generation. Specific training can facilitate the tasks of those engaged in the work of environmental assessment and management. (In general, the greater the effectiveness of information dissemination and education, the greater is the possibility that optimal solutions to environmentally-prudent and socially-satisfactory development will come about spontaneously, through popular participation)."

"For environmental management to become truly institutionalized and effective, there is a need not only for fresh initiatives in educational planning and for strengthening the linkages between various formal disciplines, but also for appropriate changes in human perceptions and attitudes. This would involve, in part, development and dissemination of pertinent knowledge and imparting instructions to cadres of administration and decision-making so that these acquire a broader perception and understanding of the human condition and inter-disciplinary out-look. The need to bring about such changes has important implications for planning and policy formulation in the field of education."

IPAL activities to date in environmental education

IPAL's stated aim is that "The results of the research will be applied in the course of management, education and training programmes aimed at preventing further degradation and, in the long term, promoting rehabilitation" (from summary Introduction to Technical Report Series).

From its beginning, IPAL has been aware that any measures suggested to rehabilitate the arid lands of northern Kenya will have to be made with a full understanding of the man-environment relation ships, and with the full co-operation of the people concerned. Thus, IPAL has endeavoured to keep close touch with the nomadic complex adaptations, and in turn integrate project findings into their thinking. In addition, IPAL has worked in co-operation with other institutions. Following are some of the activities through which this has been done:

1. Public relations extension programme

In late 1976, two public relations extension officers were appointed: one to work with the Gabbra people and one with the Rendille. Initially their function was to liaise between the project and the people through informal interactions and group meetings. They explained the aims and objectives of the project and collected information for the project. For about 2½ months, the extension officers travelled to different manyattas, living with and talking to the people. They often used slides and tape recorders for their presentations.

Some of the constraints as expressed by Yusuf, 1980, in one of the extension officer's reports were as follows:

(a) Lack of transportation made it difficult to move within the extensive study area.
(b) No evaluation was carried out.
(c) The slides presented were borrowed or copied from the scientists and not developed as a prepared programme with a specific message.

(d) Tape recorders had to be shared with other preject work so were not always available.

(e) There was a lack of appropriate materials for a largely illiterate target group.

Nevertheless this effort generated a lot of good will for the project.

2. Demonstrations

Demonstrations have been found to be an effective way of communicating project findings.

Some of the ones that have been carried out in the study area are:

(a) tree planting.

(b) experimental herds of animals showing treatment effects.

(c) enclosures demonstrating impact of livestock on the vegetation and rate of recovery.

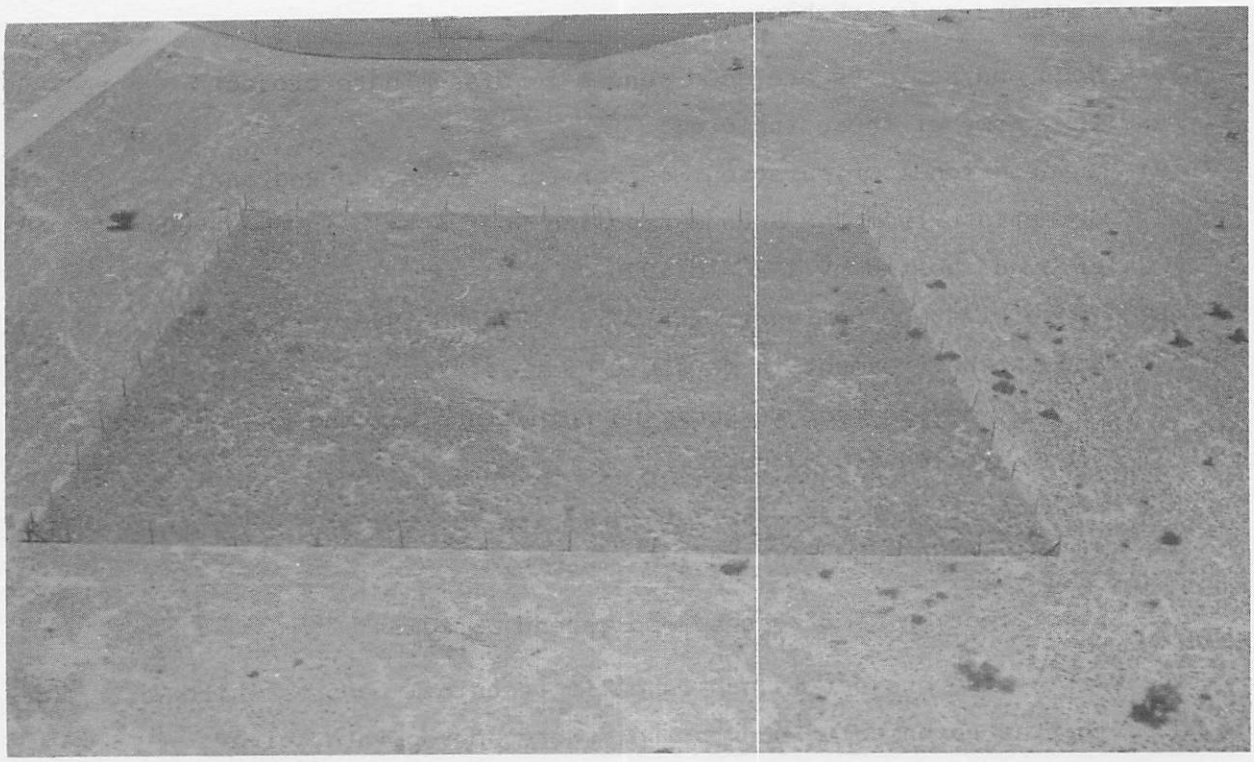
(d) fences made from available alternative fencing materials.

Some constraints of demonstrations are:

(a) many people do not yet identify with the exercise. (They do not see that what the scientists do is something they too can do).

(b) some people do not co-operate. On occasion, when the livestock have exhausted the vegetation around demonstration plots, animals have been put into graze within the demonstration plots, even though it is against regulations.

(c) there is the temptation for some people to take materials which are scarce in the study area, such as wire and other metal which may be used in the demonstration plot.



Demonstration education technique - to show impact of livestock on vegetation and rate of recovery.

3. In-service training for field assistance

Assistants receive on-the-job training on various aspects of the project's work, including ecological field techniques. The practice of moving assistants around the different field stations, gives them an opportunity to learn about all the different facets of the project's advanced studies.

4. Graduate student programme

Fellowships, facilities and supervision are provided for graduate and some undergraduate students from the University of Nairobi and other institutions to do research and work along with the scientists in the study area. This has been effective in creating interest and involvement of local professional people in the project.

The studies conducted by graduate students have been in grasshopper ecology, geomorphology, termite ecology, economics of pastoralism and veterinary studies.

The studies conducted by undergraduate students have been in insect ecology and small mammal ecology.

5. Seminars and workshops

Workshops and seminars are good venues to disseminate project results. Some of these include:

(a) International Orientation Seminar for Kenyan and Regional Scientists from the Sudano-Sahelian Region held in the study area and hosted by IPAL in 1978.

(b) Three District Seminars (in 1976, 1977 and 1978) titled "Man and the Environment in Marsabit District" in which administrators, development workers and scientists working in the study area participated.

(c) Educational seminars and workshops for University students, organizations and institutions in Kenya.

6. Dissemination of research reports and articles

The work of the project is published in technical reports which describe the technical findings and, where appropriate, give management recommendations relating to the central problem of

ecological degradation in the arid zone. These reports are of value to similar research efforts taking place in other parts of the region.

7. Communication and curriculum planning

These two areas are the main concerns of this short term consultancy.

Institutions and agencies concerned with the environment

1. The National Environment Secretariat (Kenya)

During preparations for the Stockholm Conference in 1972, the need was felt for a national body to co-ordinate environmental activities. Therefore, an ad hoc committee was appointed. In 1974, this developed officially into the National Environment Secretariat, established under the Office of the President.

Among its functions, the Secretariat considers Environmental Education to be of paramount importance. It has therefore established an Environmental Education Section whose objectives are to:

- Identify environmental education needs in Kenya and to recommend strategies for action.
- Stimulate and support programmes of enviromental education in Kenya.
- Co-ordinate environmental activities whenever the need may arise.
- Develop an awareness among the youth and the adults on the wise use of our natural resources.
- Encourage action programmes and community participation in solving environmental problems (Republic of Kenya, 1977c. p. 26).

This Environmental Education Section works closelv with educational institutions and groups such as the Kenya Institute of Education, Kenyatta University College, Kenya Science Teachers' College, the Kenya National Museum, the Wildlife Conservation and Management Services Department, the Wildlife Clubs of Kenya and the Scouts and Girl Guides Associations. It provides advisory services, holds workshops, conferences and seminars and provides some environmental educational materials.

A recent study reviewing the institutional framework for resource management in Kenya, recommended a revised stronger role for the National Environmental Secretariat which would include conducting a national campaign to re-educate the population on the environmental crisis, beginning with decision-makers, and to stimulate education to play its vital role.

"The conventional approach to environmental education is rather a weak one resulting in academic studies or formal lessons in ecology. The approach needs to be very different and should involve:

- making environment a "live issue" in Kenya;
- stressing the ecological perspective to sectoral workers (extension officers) and encouraging integration;
- ensuring that environmental principles are inserted in, for instance, the training of engineers;
- informing the population of what is happening to the environment of Kenya and why;
- holding seminars to review the impact of present and proposed activities;
- spreading information on what is happening in other countries with similar problems" (Kinyanjui and Baker, 1980 p. 25).

2. Agricultural colleges

Sang'alo Institute of Science and Technology

Located near Bungoma, this institute operating under the Ministry of Higher Education, offers a three-year programme aimed at providing a broad base in the diverse farming systems found in Kenya. It prepares students to work in Agricultural Extension, Farmer Education, Farm Management, and/or Crop and Livestock Production.

As yet, there is no specific environmental education course listed in the catalogue. However, students are required to take a 30 - hour course, Introduction to Range Management (Course number AH 103) during the third term of their first year. IPAL's Technical Reports on Rangeland and on Livestock studies might be useful additions.

Bukura Institute of Agriculture

This institute, operating under the Ministrv of Agriculture, opened in July 1974 admitting both men and women students.

The purpose of the institute is to train, at certificate level, Technical Assistants (TAS) in Agriculture and Home Economics who can then work as part of a rural development team.

In addition to its training function, the institute has held a one-year investigation on an Outreach Programme (investigation into the implementation of community surveys required for programme planning). It has also held seminars on curriculum development for the institute, and a workshop on the development of a training unit on Village Technology.

Recommendation

As some of these trainees may form part of a development team in the arid lands, it seems appropriate to investigate the possibility of incorporating a special unit or module on arid land conditions and needs.

Embu Institute of Agriculture

This is a small institute, operating under the Ministry of Agriculture, whose objective is to train Agricultural Technical Assistants to work as extension workers.

Formal training in agriculture is provided for two years for students who have completed Form IV.

The programme of studies covers the areas of: Crop Production, Animal Production, Farm Management, Agriculture Engineering, Home Economics and Extension.

Recommendation

That literature on IPAL's work, particularly on aspects of Rangelands and Livestock, be provided.

Egerton College

Established in 1939, the college attained the status of a Government Agricultural College in 1952. In 1955, the "Egerton Agricultural College Ordinance" specified that the college should function as a parastatal organization. Since then, it has expanded rapidly to meet the increasing demand for competent agricultural personnel both in Kenya and in other countries in East Africa.

The college has an annual enrolment of approximately 800 students undergoing a 3-year course of study.

It offers the following Diploma Programmes:

Diploma in Agriculture and Home Economics
Diploma in Animal Husbandry
Diploma in Animal Health
Diploma in Agriculture
Diploma in Horticulture
Diploma in Dairy Technology
Diploma in Food Science and Technology
Diploma in Agricultural Education
Diploma in Agricultural Engineering
(a) Soil and Water Engineering
(b) Farm Power and Machinery Engineering
Diploma in Range Management

The facilities of the college include well-equipped laboratories, a wide range of agricultural machinery, extensive lands, and animals, and one of the largest agricultural libraries in East Africa (30,000 books).

Most of the courses pertain to the environment, and there are several courses, e.g. Soil and Water Conservation, Ecology, and Principles of Range Management, where units on desertification and other project findings could be corporated. In addition, a course outline for a new environmental education course has been developed.

Recommendation

To liaise with the college authorities, and co-operate in the incorporation of a section on the ecosystems of the arid lands in northern Kenya. (Consider the possibility of a case-study approach which would have implications for students coming from other East African countries.)

3. The University of Nairobi

This institution gained university status in 1961. Since then it has expanded considerably in size and scope. Presently it consists of the following faculties, institutes and schools, which are located in six campuses:

Faculty of Architecture, Design and Development
Faculty of Arts
Faculty of Commerce
Faculty of Education
Faculty of Engineering
Faculty of Law
Faculty of Medicine
Faculty of Science
Faculty of Veterinary Medicine
Institute of Adult Studies
Institute of Development Studies
School of Journalism
Population Studies and Research Institute
Institute of Computer Science

Each of the above in turn consists of several departments. For example, the Faculty of Agriculture has 7 departments, including Forestry, and Range Management (University of Nairobi, 1980-81).

The Faculty of Education operates from Kenyatta University College. (It will be listed separately.)

Various faculties and departments of the University offer courses in environmental education, most of which are disciplinary in nature. Some examples follow:

(a) Undergraduate courses

Department of geography

The Earth's Physical Environment, Geomorphology, Climatology, Biogeography/Nature Ecosystems, Principles of Development and Conservation, Population Geography. The East African Environment Pedology and Soil Mapping, Arid and Semi-Arid Lands, Applied Hydrology. (In these courses, effort is made to show the relationships and interactions between man and his environment).

Faculty of engineering

Water Resource Engineering, Public Health Engineering, Hydrology.

Departments of botany and zoology

Introduction to Ecology and Bioanalysis, Rangeland Ecology, Environmental Physiology, Plant Ecology, Fundamentals of Hydrobiology, Industrial and Soil Microbiology, and Natural History of East Africa (these attempt to show interrelationships between fauna and flora and environmental factors such as water, food and energy).

Department of meteorology

Physical Meteorology, Tropical Meteorology, Hydrology and Agrometeorology.

Faculty of agriculture

Introduction to East African Agriculture (where aspects of physical geography, climate, vegetation and soils of East Africa are taught). Soil Science, Rural Sociology (including the study of farming and pastoral communities).

Department of forestry

Forest Ecology and Climatology (relates concepts of ecology to land utilization), Soil and Water Conservation, Wildlife Ecology and Management, Forest Management.

Faculty of medicine

Behavioural Science, Medical Sociology and Community Health.

(b) Post graduate programmes

Faculty of science, department of chemistry
Programme in Environmental Chemistry (including Fuel and Chemistry), Water Chemistry, and Industrial Chemistry.

Faculty of science, department of zoology

Programme in Biology of Conservation (including Principles of Ecology, Land Use Planning, Population Ecology, and Plan Communities of East Africa). Programme in Entomology (including courses on crops pests and animal pests, etc.

Department of urban and regional planning

This department trains physical planners for work in the East African Sub-region. Their training is organized under four divisions - enviornmental, resource-use, transportation and management, and is co-ordinated by a division which considers physical planning within the context of national development. Emphasis is placed on the human settlement concept within the environmental framework. (Subba Krishniah, 1978).

The list above of courses which relate to environmental education is not complete. It is only used as an illustration.

Up to now IPAL has made a significant input into University activities. This has been done in several ways:

(i) Fellowships and/or facilities for research have been provided by IPAL in the study area for some University students;

(ii) Scientists have worked in close co-operation with some of the departments of the University, e.g. IPAL's livestock ecologist works closely with the Department of Veterinary Medicine;

(iii) Scientists have been speakers and participants in various workshops and seminars, e.g. the Seminar in Arid Lands held by the Department of Geography in August, 1981.

Recommendation

That the three activities above be continued, and that the possibility of holding a specific seminar on IPAL for representatives from all appropriate faculty departments be considered to explore ways and means of integrating IPAL research findings into existing courses in the various departments.

(c) The School of Environmental Studies, University of Nairobi

The concept of a School of Environmental Studies has been developing since 1978, with assistance of academic advisors from the post-graduate Faculty of Environmental Studies at York University, Toronto, and financial support from the Canadian International Development Agency (CIDA). In March 1981, the Senate approved the syllabus and regulations for the school, which will have its first intake of a small number of post-graduate students in September, 1981. Initially, the students will register in one of the post-graduate departments which are co-operating with the schools. They will pursue a programme of studies consisting of a "core" curriculum of special interdisciplinary studies arranged by the school, plus regular disciplinary work. When fully operational (envisaged in the mid - 1980's), the annual intake of the school should consist of about twenty students registered for a 2-year course leading to a Master's degree. It is hoped that the school will develop into a regional facility, with students from other African countries.

Initial discussion about integration of IPAL findings into this programme were fruitful, and there are several possibilities.

Recommendation

That further consultations between IPAL and the School of Environmental Studies explore how IPAL resources may be used for:

- development of case examples;
- general sensitization;
- practical research;
- guest presentations;
- sites for field trips

4. Kenyatta University College

In 1978, the Faculty of Education of the University of Nairobi moved together with its associated research activities to this teacher training institution. Therefore the college now has the responsibility for all under-graduate and post-graduate teacher training programmes. Its graduates generally move into teaching positions in secondary education and in educational administration.

Following an environmental education seminar organised by the World Confederation of Teaching Profession (WCOTP), at Mombasa in 1974, the college embarked on a project of developing under-graduate and in-service environmental education programmes with the goal of preparing teachers to teach environment education in secondary schools.

The degrees offered are:
Bachelor of Education in Arts;
Bachelor of Education in Science;
Bachelor of Education in Fine Art;
Bachelor of Education in Home Economics;
Bachelor of Arts in Fine Art.
It also offers Master's and Doctor's degrees. In addition, the college has a two-year Diploma in Education course for post 'A' level candidates.

In the past few years, the college has been active in promoting environmental education. It has a representative on the working committee of the National Environment Secretariat, and participated in the formulation of Kenya's Country Position Paper on Environmental Education for the Tbilisi Conference in 1977. Among its various activities, the college hosted the Workshop on Environmental Education and Training in African Universities in 1978, and co-operated with the National Environment Secretariat in organizing the National Symposium on Environmental Education held in January, 1979.

Several of the courses under various departments relate to the environment. For example, the Department of Chemistry offers a course in Environmental Chemistry (explores some of the effects of chemistry on man with regard to his home, clothing, fuels, agriculture, and also deals with various aspects of pollution).

The Departments in the Faculty of Education offer courses such as Man and the Universe in Society, Education Media and Resources and Education and the Survival of Man.

In 1977, the Kenyatta University College Academic Board established an Environmental Education Committee to co-ordinate activities in this field. At present this committee has a proposal for an interdisciplinary Environmental Education Course which will be submitted to the Senate. If approved, every student at KUC would be required to take it. It is within this course, possibly under the proposed section entitled "Society, Culture and Environemtal Awareness" that IPAL's findings might be integrated.

Recommendation

That consultations be held between IPAL and the KUC Environmental Education Committee, for the purpose of integrating IPAL material into their proposed interdisciplinary Environmental Education Course.

5. The Kenya Institute of Education

This institute is the curriculum development section of the Ministry of Education. It conducts research and prepares syllabi and teaching materials for:

1. pre-school education;
2. primary school education;
3. secondary school education;
4. non-university teacher education;
5. special education;
6. school and non-school technical and business education.

An Environmental Science Panel has been found at KIE. Its members have been drawn from several ministry departments and schools, and its main task is to provide guidelines and develop

teaching materials. For example, it guides the environmental approach to be taken with regard to topics within science, geography and agricultural subjects in the primary, secondary and teacher education institutions (Kamunge, 1979).

Presently, there is a Primary Education Project being undertaken with the purpose of revising the whole primary education syllabi. In primary science, the statement of objectives lists one of the main objectives as follows:

"At the end of the course the learners will be better able to:-
Identify the major factors of, and develop and use appropriate skills and technologies for solving the problems relating to:

(a) Land utilisation in their environment,

(b) Water utilisation in their environment"

(under each of these, are listed specific objectives) KIE, 1980).

The syllabi, and materials for pupils and teachers have already been developed for lower primary science (classes 1 through 3)

Recommendation

1. That further discussions be held with KIE, specifically with the Environmental Science Panel and the primary science curriculum developers, to discuss IPAL input, in particular for the higher primary science syllabus which is now being developed. At this time, a unit on desert encroachment seems appropriate.
2. That co-ordination efforts be made to integrate the IPAL radio programmes now being developed and translated into Swahili and English, Rendille and Swahili scripts into the regular Schools Broadcasting Programme.

6. The Kenya Institute of Administration

The institute is the main administrative training organ of the Government of Kenya. It operates under the Directorate of Personnel Management of the Office of the President.

The institute develops and operates programmes in management, administrative and professional education and training for various levels and categories of public and private sector employees.

Some of the target groups for the various courses are the Civil Service (from senior administrators of ministries, chiefs, councillors to field staff) the Armed Forces, the Police, the Prison Services, middle management in the private sector, and Local Authorities.

At present there are no specific environmental education courses as such. However, elements of resource conservation are incorporated into the Advanced Public Administration (APA) programme (Nyamu, 1979).

In addition, the institute carries out research, primarily in public administration issues, and undertakes consultancy work for the public service and other agencies.

There are five training departments:

- Public Administration,
- Local Government,
- Executive Training,
- Commercial Training, and
- Social Development.

In addition, there is the Research Department, basically a service department to facilitate and support the work of the training departments. Its main function is research and development, including development of materials for courses in the institute. In addition, lecturers from this department teach in other departments One of the most important activities of this department is the implementation of the Project Development and Management Training Programme, initiated in 1976, whose broad objective is "to provide training to senior government officers in the conceptual, social and administrative skills necessary for planning and implementing Rural Development Projects." (Kenya Institute of Administration, 1981 p. 31). The programme has 3 components: a full term course (of 13 weeks' duration), a one week seminar (now under consideration for extension to two weeks), on Project Development and Management, plus a one week seminar on Project Monitoring and Evaluation.

The participants for the PDM courses include District Agricultural Officers, Community Development Officers, Veterinary Officers, District Agricultural Officers.

During the study, the investigator met many government officers at Marsabit District Headquarters, who came from other parts of Kenya. It seems particularly important that such officials undergo some training on the special conditions of the arid lands, for they will be involved in making decisions and drawing up plans for the area.

The group discussing Non-formal Environmental Education at the National Symposium on Environmental Education held in Nairobi during January, 1979 emphasized the need for environmental education for decision makers. Their report included the following point: "Policy makers can frustrate programmes, so get them committed; these include government personnel, local authorities, managers and decision-makers in industries, the religious leaders. A good strategy would be to involve these people more often in the activities of environmental education, e.g. in such a seminar as this one (Nyamu 1979).

Recommendation

To investigate IPAL input into this programme, (possibly speakers, slide/tape presentation).

7. Primary teacher's colleges

These colleges, administered by the Ministry of Basic Education, select students who have the Kenya Certificate of Education. A number of East African Advanced Certificate Education holders are also selected for training.

Since 1977, all students follow a common course for two years. Grading is done after two years, depending on the over-all examinations performance of each candidate.

The science syllabus currently being used was prepared by the Kenya Institute of Education. The overall aims are:

1. To familiarise students with:
   (a) the nature of science as a problem solving discipline and how science is used to understand and control the

world around us;

(b) how the discipline of science is used to accumulate knowledge and how science uses knowledge to solve problems.

2. To familiarise students with the necessary techniques to:

(a) enable them to understand the thinking and learning processes of the age range of children they will be teaching;

(b) enable them to make the many classroom decisions required to bring together their knowledge of children in order to promote sound practices of science teaching.

Part of the syllabus requires student-teachers to construct adequate conceptual schemes to build a basic understanding of the environment, (including effective utilisation of the environment).

Some films and radio programmes are prepared by the Kenya Institute to support science teacher education.

Below is a list of the existing primary teacher colleges:

Asumbi	Kilimambogo
Egoji	Loreto
Highridge	Machakos
Kagumo	Meru
Kaimosi	Mosoriot
Kamagambo	St Cecilia
Kamwenja	Thogoto
Kericho	Kisii
Kigari	Kitale
Shanzu	Siriba

Recommendation

That, through discussions with the Kenya Institute of Education, project input into the science section of the syllabus which deals with the environment, be considered.

8. Primary schools

Figures from the Central Bureau of Statistics show that in 1979, the total number of primary schools in Kenya was 9,622. These were providing primary education to 3,698,246 pupils. (See Appendix I).

Students enrol for seven years, after which they are examined for the Certificate of Primary Education (CPE). The one-day examination primarily tests cognitive attributes, and is used for selection to secondary schools. As places in secondary schools are still limited, this is a very competitive examination. As a result, the whole curriculum is CPE examination oriented.

The comprehensive report of the National Committee on Educational Objectives and Policies (Republic of Kenya, 1976 p. 55) points out that "the syllabus and content of primary education have little relevance to the real social and economic environment in which the school-leavers will live and work".

The report also states that "The nature of the Certificate of Primary Examination is an accurate reflection of the objectives and programmes that underlie the educational activities of primary schools." By emphasizing mainly the academic and examination competition aspects, the seven years that the children spend at school tend to alienate them from the realities of the social backgrounds in which they will have to apply their education. As a result, few of them are willing to return to the rural areas and assume the tasks on which they and their people depend for livelihood. Even in a place like the Marsabit District, for example, primary school-leavers go to towns and trading centres where they become clearly noticeable delinquents because of lack of employment. Yet they lack motivation or skills to go back and assist their people in developing such occupations as livestock on which their own survival in that area depends.

In the last few years, the Kenya Institute of Education has been revising the primary school curriculum with the aim of greater relevance.

Within this Primary Education Project, a new science syllabus is being developed. The materials for lower primary science (classes 1 - 3) are already completed.

In classes IV and V, the pupils will be guided to use problem-solving skills in simple, concrete situations, and in classes VI and VII, they will be required to decide which problems to investigate and how to do so.

One of the nine general objectives of the primary science curriculum is "The learners will be better able to adopt solutions to problems of management and conservation of available resources" (KIE, 1981 p. 67).

Recommendation

That as soon as possible discussions with the KIE primary science curriculum developers be pursued towards the development of a unit on desertification, or case studies on arid land problems for possible integration into the higher primary science curriculum, which is now being developed. (See recommendations under KIE).

9. Secondary schools

The national total enrolment of students in secondary schools as listed in the last published Annual Report of the Ministry of Education in 1977 was 320,310 in 1486 secondary schools. Figures provided by the Central Bureau of Statistics for 1979 show a total number of 1711 secondary schools catering for 370,703 pupils.

At the end of their secondary education, students write examinations for the Kenya Certificate of Education. These examinations are set and marked by the Kenya National Examinations Council, who also publish the syllabi which are prepared by KIE in conjunction with them. (Report Kenya, 1981a and 1981b).

The introduction of Environmental Education in secondary schools has been within the existing framework of the East African Certificate of Education syllabi. For example, topics such as Forestry, Soil Conservation, Ecology, Sources of Energy, Composition of Air, etc, exist in the science syllabi.

Therefore what has been done is to orientate the teachers and students to the environmental approach and emphasis in their teaching and study. This has been done through Inspectorate Circulars, issued by the Subject Inspectors, emphasizing the "environmental" areas and suggesting teaching approaches. (Kamunge, 1979).

Recommendation

That the East African Certificate of Education syllabi in Biology be reviewed, and areas which lend themselves to integration with project findings be identified for the purpose of providing reference material, particularly in arid land ecology, for teachers and pupils. (This material could possibly be distributed, with ministry support, through the inspectorate).

10. Adult education institutions

The Institute of Adult Studies (IAS) is the main extension arm of the University of Nairobi which is engaged in adult education and training activities. Aside from many in-service type courses, it offers a one year course leading to the Diploma in Adult Education. Examples of target groups are: adult education officers, tutors in teacher training colleges, extension workers, e.g. farmers' trainers, health trainers, literacy teachers, etc., public relation officers of co-operatives, civic leaders, industrial relations, personnel management, and youth and women leaders.

There are various organizations, such as the Christian Council of Kenya, and the Afrolit Society who are also co-operating in adult literacy programs.

The Kenya Adult Education Association, was founded in 1977, with the purpose of bringing together all those persons involved in the education of adults in all its facets. Its aims include: the promotion of adult education; serving as a forum for exchange of information related to ways and means of educating adults (conferences, workshops, exhibitions, etc.); and promoting adult education research projects.

Recommendation

That since literacy-campaigns are such a high priority in Kenya, that IPAL consider publishing a simple "reader" featuring some aspects of arid lands, which could be used in adult literacy classes.

11. The Kenya Science Teachers' College

The college was established to train science teachers for secondary schools with support from the Government of Sweden, and opened officially, at its present site, by His Excellency Mzee Jomo Kenyatta, the President of Kenya, on October 30th, 1968. Since its first intake (48 students in 1966), it has trained roughly 1500 teachers, in the main subject areas of Biology, Chemistry, Physics, Industrial Education and Mathematics (Mbogho, 1977). It offers a 2 year course of study.

In May, 1977, Environmental Science was taught as a subject to all the students at KSTC (Muthuni, 1977). Apparently it was the first Environmental Education Course, taught as such, at a higher institution, and therefore it has served as a model. Its aims, objectives and content were described in detail by Ase and Muthui (Republic of Kenya, 1977).

The revised course, for 1981-1982 is compulsory for all diploma students and is planned to commence from the 2nd term of the 1st year to the 1st term of the 2nd year. A total of 130 hours will be devoted to the subject. The major components of the course are: Ecology and Management of Natural Resources, Environmental Health, Food and Nutrition, Population, Man-made Environment, Technology and environment, The Space Environment, and Environmental Management Education.

Initial discussions re integration of IPAL findings have been fruitful. At present, use is being made of IPAL Technical Reports. Also IPAL scientists have, on occasion, been invited as guest speakers.

Two areas, within the new revised syllabus, lend themselves to project input:
Under Ecology and Management of Natural Resources, a section on desertification has been added. Also under Environmental Management Education, there is a section which specifically deals with the Role of International Organizations. Interest has also been specially expressed into the possibility of using the IPAL study area occasionally as a site for field trips.

Each year, the course requires involvement in a project for an event of international character, e.g. World Environment Day, with the aim of involving the whole institution.

Recommendation

That yearly input from IPAL for this course be systematically planned. This may consist of speakers, slide/tape presentation, hosting a field trip, or involvement in a "Desertification" theme group project.

12. The Polytechnic Colleges

The Kenya Polytechnic Teachers' College, based in Nairobi, was set up for the purpose of training teachers for secondary schools. The Kenya and Mombasa Polytechnic Colleges are technical colleges. The Kenya Polytechnic is located in Nairobi, and the Mombasa one is at the Coast. They both train technical staff for the public and private sectors and are the sites for many in-service training courses.

Although they offer some environment-oriented courses, environmental education, as such, has apparently not received too much emphasis.

Since these colleges reach a segment of the population which is directly dealing with use of resources for commercial and industrial purposes, it seems appropriate to investigate further how best to introduce environmental education concepts into their technically-oriented curricula.

Recommendation

That discussions be held with representatives of these institutions, with a view to acquainting them with the IPAL project and providing them with general information, to make an input at least at the sensitization level for the time being.

COMMUNICATION

Communication and environmental education

Environmental education and the dissemination of information are increasingly being thought of together because there is a growing realization that the solution to environmental problems will require an integrated approach by all different levels of the community. Therefore all must be aware and informed. In fact education and information became the joint action basis of the United Nations Environmental Programme (UNESCO, 1977d).

At a workshop, sponsored by the National Environment Secretariat, in which researchers, experts, and policy-makers met to consult on environmental training needs in relation to development goals and priorities, the following point was made: "The attainment of desirable environment and development goals for Kenya rests upon the perception by every Kenyan, young or old, of their individual role in shaping and affecting natural, man-made, urban and rural environments. Without that environmental 'consciousness' and 'awareness', essential improvements in Kenya's future will be retarded" (Republic of Kenya, 1981 p. 16).

Therefore, the workshop assigned the highest priority to the shaping of this awareness at every level of Kenyan Society ... a process called "environmental education." To be successful, this process needs to involve all the country's formal and informal educational and communication resources: primary, secondary, post-secondary, academic and technical schools; adult literacy and continuing education programmes; radio, television and the press, barazas and other public meetings, field extension workers and, above all, effective political communication are all required in this effort. This is large-scale training and retraining and is the major task predicating the development of the political and social "will" to deal effectively with environmental problems and development opportunities. All other tasks follow afterward. (op. cit)

The participants felt that before problems of the physical environment can be tackled, problems of the human environment (perception, attitudes, communication and will) must be overcome. Often, technical solutions to environmental problems cannot be implemented because current attitudes must first be changed. Modifications to current life styles will only occur willingly when individuals understand why they are necessary. Therefore this places great importance on the dissemination of appropriate information.

"Communication politicians and experts all agreed that there must be a radical improvement in the quality of communications, first between themselves and second with the people of Kenya, if the country's serious problems of environment and development are to be successfully addressed." (Republic of Kenya, 1981c p. 12)

IPAL's concern in this area prompted a survey of existing communication media, particularly in the study area, for the purpose of finding the most suitable means of communicating with the nomadic pastoralists in the area.

Infrastructure for communication in Kenya

Communication is a function of the economic, political and social components of the country. In Kenya, the infrastructure for communication consists of the following:

(a) Transport and power services.
(b) Telecommunications.
(c) The graphics industry.
(d) The Government Printer.
(e) Libraries.

Whereas this infrastructure is established and developing, there are definite limitations in regard to its services to the rural areas. Some of these are as follows:

(a) Communications are very much dependent on transport and power facilities. Remote areas and those lacking power are left out. For example, media such as newspapers, television and telephone are found only in urban and semi-urban areas that have transport and power facilities.

(b) The graphics industry, one of Kenya's fastest growing industries, is concentrated in Nairobi. Out of the capital, it is unable to provide the basis for locally printed communications media which could be suited to serve the cultural needs of outlying communities.

(c) The Government Printer's services are limited to government work.

(d) The percentage of people who have formal education, and can benefit from library services is low. Also, there is a scarcity of libraries and books in the rural areas.

(e) The high rate of illiteracy, particularly in the rural areas (it is estimated to be 60% in Kenya; 75% in women alone) limits the media that can be used because so much of it requires literacy and numeracy.

(f) Although Swahili was promoted as the national language (it was even adopted in 1975 by the Union of Writers of African People as the continental language) there has been an increasing tendency for English to dominate the mass media, even at the expense of the Swahili-language news media. This has happened despite the fact that research has shown that at least 65% of Kenya's population prefer full use of Swahili and 73% prefer Swahili as a national language. (Mwaura, 1980)

Communication in the study area

A preliminary survey to attempt to find appropriate communication channels reviewed the following:

1. Telephone

The only part of the study area which has telephone services is Marsabit town. Although there are frequent break-downs, the telephone does provide an important link with other parts of the country. There are plans for the installation of phone service in Moyale this year.

2. Television

Television service was started in Kenya 17 years ago. It serves a very small segment of the population, probably because TV sets are expensive. The service covers a radius of 150 kilometre from Nairobi. In 1970, a transmitter station was opened in Mombasa and serves a radius of 110 kilometre from the town. There are now also two booster stations to cover western Kenya and the area around Mt. Kenya.

An interesting aspect of TV is that it has a lot to offer, specially as a medium of education. Research studies carried out by the University of Nariobi's School of Journalism showed that television has a greater impact among educated people in Kenya than does newspapers or radio. (Stauffer, 1979)

In relation to the study area, however, this medium is out of the question, for now there are no television services to the study area.

3. Press

The English press, first set up to cater for the needs of the settlers, was well developed by the 1940s. The African press was specially set up to call for freedom, and thus after independence it lost importance. Many newspapers have come and gone, with over 400 being registered in Kenya at one time or another. Presently there are two English-language dailies, one Swahili-language daily, three English-language weeklies, two Swahili-language weeklies and three English-language monthlies, but there is much fluctuation.

The press is English-language dominated and urban-based and urban-oriented. It is criticized as having little relevance to rural areas, and this is supported by the fact that a survey completed by ABC in January 1973, showed that only 21.7% of the total rural population read the newspapers every day, and 43.2% do not read them at all. (Mwaura, 1980) Because of this situation, cognizant of the importance of the press in national development efforts, the government is planning to give more attention to the establishment of a rural press. Three rural newspapers, "Sauti ya Kisumu", "Sauti ya Meru", "Sauti ya Kericho", are already being produced.

Some major constraints to the effectiveness of the press and publications as means of communication in rural areas, and specifically in the study area, are as follows:

(a) Distribution is limited to areas with fairly good road or rail transport.

(b) Language is a big problem as there are still many people, specially in the study area, who cannot speak or read English or Swahili. There is a very definite lack of printed material in the vernacular languages.

(c) This medium requires literacy of the target population. Illiteracy in the study area is even higher than the national average of approximately 60%.

(d) No adequate print material was found for new literates.

The newspapers which are printed in Nairobi do not reach the study area regularly. Newspapers were found to be highly appreciated in Marsabit town. But it was noted that the newspapers which were being read there at the time of the study were several days old. Free magazines from the Ministry of Information, e.g. "Habari", (a quarterly Swahili pictorial magazine with a circulation of about 100,000) and "Kenya Yetu" are distributed through the District Headquarter's Information Officer mainly to chiefs and to schools. No newspapers or publications were seen in the manyattas of the nomadic people.

4. Posters and circulars

These were evident in Marsabit town, but not seen within the rest of the study area, except in health service dispensaries, missions and occasionally in schools. Even in the shops in settlements such as Korr or Kargi, there was an absence of posters or circulars.

5. Cinema

Kenya has a well-organized mobile cinema industry, and three major organizations in the country operate mobile cinemas (free to the public).

They are:-
The Ministry of Information and Broadcasting, Factual Films Ltd., and Film Corporation of Kenya. The Ministry of Information generally presents films of an educational nature, whereas the other two companies present inexpensive entertainment films plus a lot of commercials, for they make their money through advertising.

All three organisations draw very large crowds, and there is a demand for more films. The main constraints to the Ministry of Information's endeavour are:

(a) the vans break down frequently

(b) many of the films are quite old and have been repeatedly shown

(c) films have failed to achieve their objectives because they are not adapted to the audience at hand, i.e. "The films Rudini Mashambani Development, and those pertaining to agricultural development in the country had failed to have meaning when screened to nomads in the arid parts of the province although it can generally be said that the films provided a sense of joy and belonging". (From a report from Eastern Province dated 13 April, 1976).

These mobile cinemas have reached Marsabit, in the periphery of the study area, but people who were interviewed could not remember having seen one within the study area. The only films that were recollected being shown within the study area were occasional "religious" films which were shown in some missions.

Thus it appears that cinema is as yet a largely unexplored medium of communication within the study area.

6. Radio broadcasting

In Kenya, the most important medium for mass communication is broadcasting. In 1969, there were roughly 775,000 radio sets in homes and about 6,000 in public places. The estimate for 1980 was roughly 1.6 million sets. (op. cit)

Table 3. Voice of Kenya eastern station vernacular services Rendille and Boran

Day of the week		Rendille	Period of time in hours	Boran	Period of time in hours
Monday	A.M.	10.45 - 12.00	1¼	12.00 - 12.45	¾
	P.M.	7.45 - 8.15	½	3.30 - 5.45	2¼
Tuesday	A.M	10.45 - 12.00	1¼	12.00 - 12.30	½
	P.M.	7.45 - 8.15	½	3.30 - 5.45	2¼
Wednesday	A.M.	10.45 - 12.00	1¼	12.00 - 12.45	¾
	P.M.	7.45 - 8.15	½	3.30 - 5.45	1¼
Thursday	A.M	10.45 - 12.00	1¼	12.00 - 12.45	¾
	P.M.	7.45 - 8.15	½	3.30 - 5.45	2¼
Friday	A.M.	10.45 - 12.00	1¼	12.00 - 12.45	¾
	P.M.	7.45 - 8.15	½	3.30 - 5.45	2¼

The Voice of Kenya (VOK) a unit under the Ministry of Information, operates the country's only radio and television stations. It broadcasts on short-wave and medium-wave transmitters installed at Ngong and five radio-transmitting stations in other parts of the country. There are two regional radio stations at Kisumu and Mombasa.

VOK has two full services in English and Swahili, and 17 vernacular broadcasts. It is interested in expanding its services to the rural areas, fully cognizant of the importance of communication for development. In this respect, it welcomes programmes which will disseminate information on agriculture, health and hygiene, community development, etc. It transmits programmes prepared by the Kenya Educational Media Service for primary, secondary and teacher training schools. Other educational programmes prepared by various ministries (e.g. Agriculture, Co-operatives) are also broadcast.

Presently, the regular VOK services within the study area are very limited. Table 3 shows the vernacular services for Eastern Province during the first half of 1981.

Some constraints identified in the use of this medium, with special reference to the study area are:

(a) Poor reception in some areas. There has been quite a lot of interference (other programmes mixing in) reported.

(b) Radio is still a "foreign" idea.

(c) Radio sets are relatively expensive and not easily accessible.

(d) Timing of the few programmes in the vernacular languages is often inappropriate.

(e) Content of the programmes, as they now exist, is determined by the producer and not through a needs assessment process.

(f) Most of the transmission to the study area now consists of music.

(g) The "news" reports are mainly national news, with very little local news.

(h) Except for Schools Boardcasting Service, there was no evidence of organized use of radio programmes.

7. Barazas

Barazas (public meetings) are a common form of mass communication in the rural areas. In the study area it is the main way in which a chief or sub-chief communicates with the people in his area, so most barazas are called by them. In addition, it is the main venue for communications from the District Headquarters. In that case the District Commissioner asks the chiefs, who in turn notify the sub-chiefs, to call a baraza. At these times, the heads of the various district departments (e.g. Health, Education, Livestock) are invited to send representatives to address the baraza. There appears to be no regular schedule for barazas. Rather, they are called as the need arises. For example, the researcher observed a baraza at Gatab which was attended by the sub-chief and chief of the area plus members of the Administrative Police and Kenya Police and home guards and elders. This baraza was called for the purpose of conducting an investigation into a livestock raid which had recently occured. At the baraza, groups were organized to look for the missing cattle. Barazas in the study area are usually

attended by elders from each manyatta who in turn convey the information to their own manyatta. Women do not usually attend.



Baraza at Korr

Sites for the barazas are usually the locations of the chiefs or assistant chiefs. Table 4. lists those in Marsabit District.

Table 4. Locations of chiefs and assistant chiefs in Marsabit District - sites for barazas - May, 1981

Division	Location of chiefs	Location of assistant chiefs
Moyale ($2,841\ km^2$)	Moyale	Neilu
	Moyale	Manyatta Burji
		Moyale Township
	Butiye	Butiye
		Odda
	Godoma	Dabel
		Godoma
Sololo ($3,966\ km^2$)	Sololo	Sololo Town
		Dambala F.
	Uran	Uran
		Waldaa
		Golole
(part of Laisamis)	Marsabit Town*	Marsabit Township
		Dakabaricha
Mountain ($2,000\ km^2$)	Sagante*	Sagante
		Diribagombo
	Karara*	Karara
		Songa
Laisamis ($29,178\ km^2$)	Logologo*	Laisamis
		Logologo
	Korr*	Korr
		Ilaut/Ngurunit

Table 4. contd.

Division	Location of chiefs	Location of, assistant chiefs
Laisamis ($29,178\ km^2$)	Loyengalani*	Loyengalani Mt. Kulal
	Kargi*	South Horr Kargi
North Horr ($38,927\ km^2$)	Maikona*	Maikona Bubisa Kalacha Hurri Hills/forele
	North Horr	North Horr Balessa
	Dukana	Dukana Ileret
* Within the study area.	Total = 15	Total = 34

Some of the problems of using barazas as communication channels in the study area are that:

(a) they are most often used for administrative or disciplinary purposes, rather than for educational or development reasons

(b) with so many people participating in one baraza, they tend to get lengthy and boring

(c) usually, the communication is from the administrators to the people (one way), opportunity for feedback and dialogue is limited due to numbers

(d) sometimes, the timing and the notification efforts are poor, so attendance is variable

(e) the impact made by speakers at a previous baraza, reflects on the speakers at the next one (i.e. broken promises)

(f) with so many administrative officers coming from outside the area, translation is necessary, and this creates problems of interpretation. Sometimes the information is presented at an inappropriate level.

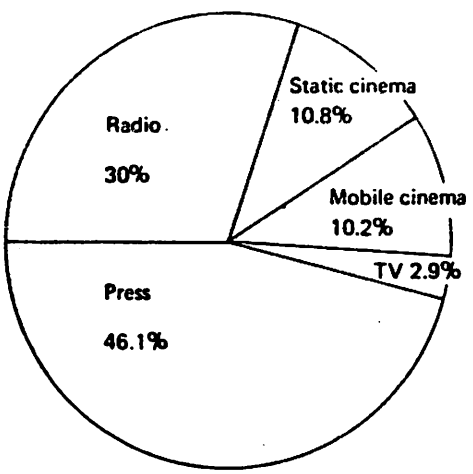
8. Advertising

Although not a communication medium as such, advertising as a "channel" of communication is mentioned here because of its prominence in Kenya, and its implications for the future in the study area. Already, there is much advertising in evidence in Marsabit town.

In the African continent, Kenya is second only to South Africa and Zimbabwe in terms of its expenditure on advertising and promotion, in proportion to the gross national product. Fig. 3 below shows how over 40 million shillings was spent in 1976 advertising and promotion through the various media.

This policy of widespread advertising has social implications, specially for unsophisticated people, such as those found in the study area. It has been found that in largely unsophisticated societies, advertising can do a lot of damage, such as misleading poorly educated mothers into giving up breast feeding in favour of milk preparations. (There is a tendency to believe everything that is heard, and some people cannot distinguish commercials from normal programming).

Figure 4. Advertising expenditure by medium, Kenya, 1976
Source: Sunday Nation, 28 August, 1977



In developing countries, much of the advertising is generally carried out through radio and television, although in Kenya most of it is presently through the press. However, it is very likely that advertising will penetrate the study area first through the radio, and that it will have a greater impact through that medium.

9. Two-way radio

This type of communication is useful in remote parts of Kenya, and therefore, in the IPAL study area, it plays a very important role. Two-way radio links the IPAL field stations of Gatab and Ngurunit with each other and with Nairobi. Mission stations in the area also use this type of communication.

At District Headquarters, a two-way radio morning call up links Marsabit District with all the other districts in Eastern Province and with Nairobi.

Below is a list of sites of two-way radios which provide communication within the district administration:

Administrative Police Station (14 to 24 hour radio service)

Marsabit District Headquarters
Moyale Sub-district Headquarters
Sololo Division Headquarters
(more AP radio sites are planned for Uran, Dambala Fachana, Bori, Dabel and Godoma).
There are also two mobile units with radios.

Kenya Police (24 hour service)

North Horr
Loyangelani
Salae
Ducama
Ileret
South Horr
There is also one mobile unit with radio

Ministry of Information and Broadcasting (12 hour service)

Marsabit

Moyale

Prison Services (12 hour service)

Moyale

Marsabit

Ministry of Health (12 hour service channelled to Flying Doctor Service)

North Horr

Mt. Kulal

Moyale

Marsabit

Loyengalani

Sololo

(In addition, there are two mobile maternal and child health care mobile units with radios)

At present, this type of communication is by far the fastest and most useful kind of communication within certain points in the study area.

The main constraints for this channel of communication are:

(a) Use of these sets is limited, primarily to the administration.

(b) Sets are expensive, and not within most people's means.

(c) They require a high degree of organization and planning for their use.

(d) They are not useful for mass communication as only two people use it at a time.

10. Interpersonal communication

Person-to-person communication is the most commonly used form in the study area, and one which deserves further investigation.

When two people meet, they greet each other and then ask about the news, which usually refers to water, vegetation, animals, and security. For example, if in reply to a greeting, a Boran answers "Robaf Naya" (Peace and Rain), this means that all is well.

People find out from each other information such as how many people are using certain wells or how many manyattas there are in a certain area. Therefore this type of communication helps guide people's movements towards or away from certain watering points or grazing lands.

If a chief wants to call a meeting (baraza) or if an important message needs to be disseminated this is done by sending a messenger who walks to the next manyatta. From there, a new messenger then goes to the next manyatta, and so on. In this manner, a message may travel 30 kilometres within 6 or 7 hours.

Interestingly enough, extension officers, missionaries and researchers all become part of the "messenger system" within the study area. The regular truck run from the distribution of famine relief supplies, a scheduled visit to an area by a missionary or health worker, the monthly visit of the UNESCO plane to pay wages to employees at field stations ... all these become regular channels whereby oral and written communications are exchanged within the area.

11. Extension services and rural communication services

There are a large number of ministries conducting services to rural areas including the study area. These along with several Non-government Organizations and International Organizations, who are carrying out specific development projects, are involved in the communication process. These include:

Ministries:

Cooperatives
Health
Agriculture
Education
- Education Media Service

Information and Broadcasting
- Voice of Kenya and Kenya Institute of Mass Communications

Housing and Social Services
Office of the President
- District Development Committees

Labour
Tourism and Wildlife
Commerce and Industry
Finance and Economic Planning
- Rural Services Co-ordination and Training Unit

(Appendix IV shows expenditure in education and training for each ministry)

Education agencies:

University of Nairobi
Institute of Adult Studies
Bureau of Educational Research

Non-government organizations:

National Christian Council of Churches
National Council of Women of Kenya
Kenya Catholic Secretariat
African Medical Research Foundation

International organizations:

FAO	UNICEF	WHO
UNESCO	UNEP	UNEPA

The functions of these "communicators" were identified, at a National Workshop on Communication held in Kericho in 1978 (Barret, 1978 p. 16). They may involve some or all of the following:

Research	Technical, social or media
Production	Radio, films, publications, etc.
Distribution	Post, extension agent, broadcasting, cinema vans, etc.
Training	Field officers or media personnel
Extension Activity	Technical or information specialists.

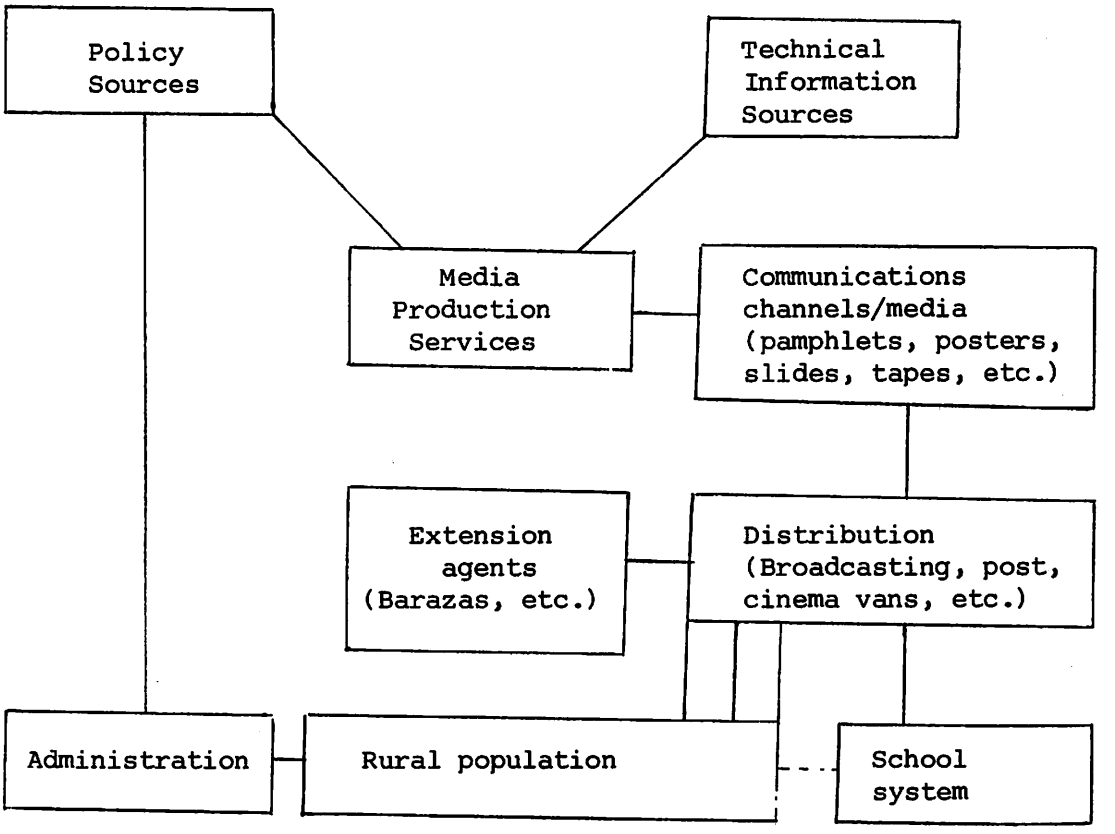
The main constraints to extension services in the area were found to be:

(a) Very large areas assigned to one extension worker.
(b) Lack of good roads make regular visits from extension workers difficult and sometimes impossible.
(c) The lack of amenities and harsh desert conditions discourage much travelling within the area.
(d) There appears to be little communications training for extension workers.
(e) Extension services are slow to reach large numbers of people.
(f) Little integrated planning of different services.

(g) Feedback from the field is poor. Materials and messages are not always followed up.

Fig. 5 illustrates the "one-way" nature of the communication process as it exists in the rural areas.

Figure 5. The communication process



Source: Barret, M.
Rural Communications, Management and Media, 1978, p. 18

RENDILLE RADIO PROGRAMMES: A TEST CASE

Rationale

The success of future land management plans and arid land rehabilitation measures will largely depend on the extent to which these are understood and welcomed by the target population. Any modifications to traditional management practices will have to be seen in the light of new attitudes and information about environment. Therefore, it is imperative to look for the most suitable ways and means to communicate with the nomadic pastoralists. An initial examination of possible avenues of communication indicated that radio may be a medium which has a chance of success. Therefore, it was the first to be investigated. For this purpose, plans were made for radio programmes aimed at Rendille people, the largest segment of the population in the study area.

Objectives

The primary objective was to obtain a preliminary assessment of the use of radio as a means of communication in the area.

The radio programmes, in turn, were designed to:

1. acquaint Rendille-speaking people in the study area with the work of UNESCO, and help establish favourable public relations.
2. create awareness of environmental problems, i.e. desertification, in Northern Kenya.
3. introduce suggested measures, based on project findings, which are intended to help people improve the quality of their nomadic life
4. foster positive attitudes towards resource conservation.
5. sensitize decision-makers in the area to the need for an integrated, comprehensive resource management policy, which takes all factors into account.
6. provide an opportunity for discourse and further learning regarding the social and cultural values and traditional land use systems of the Rendille pastoralists.

Approach

All approaches were aimed at describing the research nature of IPAL activities. Several techniques were used in an effort to determine the more successful ones. They were:

1. Short talks by prominent and respected members of the area (e.g. introductory address by the Member of Parliament of Marsabit North).
2. Interviews with local people and with IPAL scientists.
3. Short stories and dramas (specially to depict environmental problems and possible solutions).
4. Descriptions of simple ways and means used to observe and study the environment.

At the end of each programme, the presenter asked two or three questions on the content. This was to emphasize the main points trying to be conveyed. After a brief period of elapsed time (allowed to encourage the listeners to attempt to answer the questions) concise answers were given.

Operational generalizations

In order to guide the development of effective radio programmes, the following generalizations applied:

1. Wisdom of the pastoralists

It is desirable to recognize, appreciate and utilize the basic wisdom of the pastoralist as the starting point of an educational endeavour, as they have a wisdom about their living conditions, social institutions, and about the risks inherent in trying something new. They have keen insight about their needs and priorities, and about means of solving their problems. Still it is appreciated that their basic knowledge needs to be integrated with scientific technology in order to discover solutions for solving present problems, i.e. desert encroachment.

2. Respect for cultural values and norms

This is necessary in order to provide the appropriate context within which change in knowledge or behaviour can take place.

3. Use of local social organizations and leaders

This may be a means of communication about, seeking support for, and legitimizing the adoption measures or changes of attitudes which will lead to improvement in the community. Also, it may provide forums for discussion, links in training, or means of administering future community programmes.

4. IPAL (as a research agent) must have something useful to offer. Any modifications of established practice must be soundly based, demonstrable, practical, and within the means and abilities of the people in the area. Any recommended practices must result in a betterment of conditions resulting from current practices.

5. Necessity to optimize opportunities for training

The development, production and evaluation of the radio programmes must be used as another venue for training.

6. Integrated approach

This is in keeping with MAB and IPAL's essence. In addition, it has another dimension in non-formal education. The pastoralists live their lives as "wholes". Any changes which are proposed must be evaluated in terms of how they fit into their total life-styles and priority needs. Even when the message of radio programmes concerns a specific topic, e.g. animal husbandry, it must relate to the total life style.

7. Literacy not a prerequisite

The development, production and evaluation of the radio programmes must take place within a framework that does not regard literacy as a prerequisite of the listeners.

8. Necessity for availability of resources

It was important to ensure that the sample population at least had access to radios. In addition, recommendations for new or modified

practices calling for additional resources must only be made if these are available, or the provision for their availability is made.

9. Necessity of governmental and pastoralists support and commitment

It would be ideal if the help provided by IPAL is commensurate with the need and ability of the people to utilize the resources without diminishing their own commitment, responsibility or dignity. In addition, it is necessary to work within the Kenya Government's Development Plans.

Physical arrangements

Development

(a) Script-writing production and most of the recording of the radio programmes was undertaken by the consultant.
(b) Translation into Swahili and Rendille and mixing the radio programmes was done by High Fidelity Production Company.
(c) Scientific input was provided by the project scientists.
(d) Recording took place both in the study area and in Nairobi.

Production

(a) Transmission was done by Voice of Kenya (VOK) at 100 kilowatts on short-wave.
(b) Each programme was broadcast two days a week. One day it was broadcast in the morning (10.30 a.m.), and the other day, before the evening news, (7.45 p.m.).
(c) The duration of each programme was 15 minutes.
(d) The programmes were broadcast initially in Rendille only.

Evaluation

(a) The development of the survey instrument (schedule or questionnaire) and the training of the assistants was the responsibility of the consultant.
(b) The pre-radio and post-radio programme surveys were carried out by the consultant and field assistants.
(c) On-going (formative) evaluation was carried out by the assistants and consultants.

Support

(a) The field assistants took the radios to the manyattas and participated in discussion after each programme.

(b) Some chiefs in the study area acted as custodians of the radio sets.

(c) Some adult educators (specially around Marsabit and Logologo) helped to take the radios to the manyattas and conducted discussions afterwards.



Group near Marsabit listening to a UNESCO ISRAHA radio programme, November, 1981.

Programme

A preliminary outline of the topic content of the programmes, and resource persons was developed as follows:

Programme No.	Topic Content	Resource Person
1	Brief introduction to IPAL, description of study area and nomadic life-style, given by M.P. of the area (Asst. Min. of the Environment and Natural Resources)	Dr. I. Allen, Consultant
2	Examples of how local people interact with their environment	Elder
3	"	Teacher
4	"	Sub-Chief
5	Introduction to the concepts of "study", "investigation" and "scientist"	Consultant
6	Camels and their study	Dr. C. Field
7	Trees and their study	Dr. H. Lamprey
8	(Our wonderful acacias)	Dr. H. Lamprey
9	Cattle and their study	Dr. C. Field
10	Field Assistants	Consultant
11	Bomas	Consultant
12	Rangelands and their study	Dr. D. Herlocker
13	Range Management	Dr. D. Herlocker
14	Health	Consultant
15	Introduction to the concept of "natural resources"	Consultant
16	Soil	Mr. A. Van Kekem
17	Wildlife	Consultant

Programme contd.

Programme No.	Topic Content	Resource Person
18	Water	Mr. J. Stephenson
19	Co-operation (IPAL works with others)	Consultant
20	Education	Consultant
21	Climate	Consultant
22	Goats and sheep	Dr. C. Field
23	Security and protection	Dr. S. Masheti
24	Marketing	Mr. G. Njiru
25	Summary	Dr. W. Lusigi

Formative evaluation

A short evaluation form (see Appendix VI) was designed to be used by field assistants after each radio programme. Data were collected on the quality of radio reception, reactions and comments of the listeners, and on the evaluator's own assessment. This on-going evaluation helped to spot weaknesses, and enable modification of the structure of the programmes in content, approach and language level.

A total of 480 evaluation sheets were collected and studied. Analysis of 272 (the evaluation sheets on each of the first broadcast of each programme at each radio site) provided the following information:

(a) Location, number of listeners, radio reception and the average number of listeners. Table 5. shows the location of the IPAL radios. The radios were purposely placed within access of the field stations, as field assistance was necessary for operating the radios, encouraging discussion and completing an evaluation form on each programme at each site.

The quality of the radio reception was variable, specially during the first part of the series. Weighted values of 1, 2 and 3 were assigned to the categories in the evaluation forms of poor, fair and good, respectively. The overall value obtained from 272 evaluation forms throughout the study area was 2.5. Therefore we can say that the quality of the radio reception varied between fair and good.

Table 5. Locations of IPAL radios and number of listeners

Location	Name of Manyatta	Average No. adults/ Programme	Average No. Children Programme
Gatab	Ilmwati	6	7
Olturot	Longoya	5	6
Kargi	Sale	10	4
"	Galdheilan	8	4
"	Rengumo	11	6
"	Urawen	11	5
Ngurunit	Lepindira	17	28.7
Korr	Gobore	11	8
"	Rengumo	24	16
"	Rengumo Town	15	11
"	Dubsahai	17	12
Marsabit	Ulaula	26	14
"	Karare	16	3
"	Sanga	10	5
Logologo	Sanjir	23	14
"	Lekuyan	31	22
"	Trading Centre	22	7
Total		16	10

* Radios were also placed at Oogom's manyatta near Olturot and at Kuturuni near Marsabit. However, raids caused the dispersal of these manyattas during the course of the radio series.

(b) Reaction of listeners

By and large the reaction of listeners was good and quite encouraging. 87% of the evaluation forms indicated that the listeners listened carefully. 52% indicated some talking during the programme, and 35% marked some laughing. 66% of the forms indicated discussion or questions after the programme. 19% indicated someone walked away.

A study of the listeners and evaluators' comments showed that the most common reason for laughing was response to local sound effects, e.g. animals, and at enjoyment of the traditional music. Talking during the programme was due to lack of interest in a few cases, but usually it was to comment on something that was said in the programme, and even more often when listeners recognized someone they knew taking part in the programme. The most commonly given reason for walking away was when a listener did not understand Rendille.

(c) Comments of listeners

A large majority of listeners comments were favourable, (76%) and expressed pleasure and interest in the programmes in one way or another. The figures are presented in Table 6.

(d) Comments of the assistants

The comments of the assistant, who filled in the evaluation form were invaluable in explaining the reactions or comments of the listeners, and in providing suggestions for improving the content and the production of the programmes. A general tabulation is given in Table 7.



IPAL field staff who assisted with the Rendille radio programmes pictured with Dr. Walter Lusigi, Project Co-ordinator (standing 5th from left) at Gatab.

Table 6. Comments of listeners
(% of radio programmes which elicited the comments)

Location	Name of Manyatta	% favourable comments	% unfavourable comments	% factual comments
Gatab	Ilmwati	77	0	58
Olturot	Lengoya	78	0	26
Kargi	Sale	75	5	40
"	Galdheilan	60	5	50
"	Rengumo	85	0	45
"	Urawen	80	5	40
Ngurunit	Lepindira	67	0	33
Korr	Gobore	71	0	14
"	Rengumo	69	0	50
"	Rengumo Town	80	5	80
"	Dubsahai	57	10	13
Marsabit	Ulaula	100	0	50
"	Karare	57	0	86
"	Songa	—	—	—
Logologo	Sanjir	78	0	56
"	Lekuyan	83	0	67
"	Trading Centre	100	0	50
Study Area Total		76%	2%	45%

IPAL F-1

Table 7. Comments of assistants
(% of radio programmes which elicited the comments)

Location	Name of Manyatta	% favourable comments	% unfavourable comments	% factual comments
Gatab	Ilmwati	62	0	65
Olturot	Lengoya	78	0	17
Kargi	Sale	65	15	20
"	Galdheilan	60	15	15
"	Rengumo	85	15	25
"	Urawen	85	5	15
Ngurunit	Lepindira	76	5	30
Korr	Goborre	90	5	19
"	Rengumo	81	6	18
"	Rengumo Town	80	5	25
"	Dubsahai	71	19	13
Marsabit	Ulaula	100	0	0
"	Karare	57	0	86
"	Songa	—	—	—
Logologo	Sanjir	78	0	0
"	Lekuyan	83	0	0
"	Trading Centre	100	0	25
Study Area Total		78%	6%	23%

Summative evaluation

Two surveys were conducted; one before the beginning of the programme, and the other after the programmes, at the end of 5½ months' time to determine whether the objectives of the programmes were achieved.

The surveys were conducted with the aid of Rendille-speaking field assistants using a structured interview schedule. The sample was stratified, representing the various elements in the Rendille population (i.e. elders, women, morans, young warriors, scholars, leaders and educators) in each of the manyattas where an IPAL radio was placed.

The interview schedule (Appendix VII) was designed to include a few questions related to each of the 6 objectives of the radio programmes.

Analysis of the results was very encouraging, showing that real gains were achieved.

106 people were interviewed before the radio programmes and 119 were interviewed upon completion of the series. As far as possible the same respondents were sought for the pre and post radio-programme interviews. However, whenever this was not possible a close match was made.

Table 8. shows the educational composition of the two samples.

Table 8. Educational composition of samples

	No. schooling adult literacy		Primary		Seven years or more			
Before Radio Programmes	81	78%	1	1%	22	21%	104	100%
After Radio Programmes	88	78%	6	5%	19	17%	113	100%
Total	169	78%	7	3%	41	19%	217	100%

To ensure that gains achieved were not due to educational differences in the two samples, a test of educational profile was carried out (Steel and Torrie, 1960 p. 366) o X^2 = 3.72 with 2 df. There was no significant difference in educational profiles at P 0.10.

Examples are provided here on the results obtained.

One of the objectives (No. 1) of the radio programmes was to acquaint Rendille in the study area with the work of UNESCO (IPAL), and help establish favourable public relations. The first three questions in the interview schedule were designed to see if this objective was achieved.

Question 1. Have you heard of UNESCO?

	YES	NO	
Before Radio Programme	72	34	106
After Radio Programme	115	4	119
	187	38	225

a significant gain ($P < .01$)

Question 2a. Do you know what UNESCO is doing here?

	YES	NO	
Before Radio Programme	34	72	106
After Radio Programme	112	7	119
	146	79	225

a significant gain ($P < .01$)

Question 2b. If yes, explain what you think UNESCO is doing here.

	Activity	Improve Environment	Direct Help	Study/Research Advice	
Before R.P.*	12	6	5	11	34
After R.P.	14	15	8	82	119
	26	21	13	93	153

* R.P. = Radio Programmes

4. In response to Question 7, about 10% of the respondents answered that the land would lose its beauty or would not look nice if it was bare. This is noteworthy, considering Maslow's hierarchy of needs which places the need for aesthetics high up in relation to basic needs for survival.

Questions 9 through 12 were designed to assess achievement of Objective 4, which was to foster positive attitudes towards conservation of resources. The questions asked the respondent whether he or she was doing anything to protect or improve:

(i) the soil,
(ii) plants,
(iii) wildlife, and
(iv) water.

Significant (P .01) gains were made in each of these areas. The smallest gain, understandably so, was achieved in the protection of wildlife. Predators represent a threat to the pastoralists' livestock and there is a stated desire to kill them all off. Consequently, whereas the sound effects of lion and hyena caused amusement and surprise of the listeners, the actual message of the programme was one of the least best received.

Objective 6 was to use the production of the radio programmes as an opportunity for discourse and further learning regarding the social and cultural values and of the Rendille pastoralists. Question 13 through 19 sought some of this information. Question 20 asked the respondent whether he or she would like to ask a question. Some interesting findings in this area were:

1. The Rendille value large families. 50% of the respondents indicated over ten children (or "as many as God will give") as being desirable.
2. They perceive the need for money, by indicating that they would value some of their children getting a wage-earning job elsewhere to help out.
3. When asked what kind of work they would like their children to do, 42.4% of the respondents answered, "go to school", and 33.7% answered, "some to look after animals and some to go to school".

Question 1. Have you heard of UNESCO?

	YES	NO	
Before Radio Programme	72	34	106
After Radio Programme	115	4	119
	187	38	225

a significant gain ($P < .01$)

Question 2a. Do you know what UNESCO is doing here?

	YES	NO	
Before Radio Programme	34	72	106
After Radio Programme	112	7	119
	146	79	225

a significant gain ($P < .01$)

Question 2b. If yes, explain what you think UNESCO is doing here.

	Activity	Improve Environment	Direct Help	Study/Research Advice	
Before R.P.*	12	6	5	11	34
After R.P.	14	15	8	82	119
	26	21	13	93	153

* R.P. = Radio Programmes

$X^2 = 11.83$ (3 df).

There was a significant difference ($P < .01$) both in the percentage of respondents who were able to answer the question after the radio programmes and in the shift from describing an activity, e.g. "UNESCO keeps herds" to an awareness of UNESCO's role in study/research/advice.

Question 3a. Do you think UNESCO is good or bad?

	Good	Bad and Neutral	
Before R.P.	55	51	106
After R.P.	111	8	119
	166	59	225

a significant gain was made at $P < .01$

Question 3b. Why do you think UNESCO is good or bad?

	Improves Environment	Provides Assistance	Study/Research Gives Advice	
Before R.P.	8	28	16	52
After R.P.	17	43	59	119
	25	71	75	171

* All these reasons followed 2 'UNESCO is good' responses. There was only 1 'UNESCO is bad' response.

$X^2 = 5.728$ (2 df).

There was no significant difference even P = 0.05. These results indicated that the value people attach to the categories above did not change as a result of the programmes.

People in the study area still valued highly any direct assistance e.g. employment which the project can provide.

Objective 2 of the radio programmes was to "help create awareness of environmental problems, i.e. desertification in northern Kenya". Questions 4 to 7 were designed to measure gains in this direction. They were:-

4. What are some of the things you get from your surroundings which help keep you and your family alive? Are there any problems obtaining these?
5. Do you think too many trees are being cut?
6. Do you think there are more or less plants here now than when your parents were children? Why do you think this is so?
7. If herds eat all the plants in area and leave the ground bare, does it hurt the land? (If answer is "yes", How?).

Appreciable, significant gains $P \geq .01$ were made in 5, 6 and 7.

Some interesting results in this area were:

1. There was some difficulty in understanding the open-ended question which asked if there were any problems obtaining some of the things we get from our environment (basic resources). An appreciable number answered "no problems". Failure of rains or lack of water was the most often-cited problem (44%).
2. A large number of respondents (41%) in the first series of interviews thought that not too many trees were being cut down due to government's advíce to plant more trees and regulations controlling cutting. The figure was reduced to 18% of the respondents in the post-radio programme interviews.
3. Surprisingly, many respondents, (50%) of those in the first series of interviews answered that they thought there are more plants now in their surroundings than when their parents were children. The figure was reduced to 39% in the post-radio programme interviews.

4. In response to Question 7, about 10% of the respondents answered that the land would lose its beauty or would not look nice if it was bare. This is noteworthy, considering Maslow's hierarchy of needs which places the need for aesthetics high up in relation to basic needs for survival.

Questions 9 through 12 were designed to assess achievement of Objective 4, which was to foster positive attitudes towards conservation of resources. The questions asked the respondent whether he or she was doing anything to protect or improve:

(i) the soil,
(ii) plants,
(iii) wildlife, and
(iv) water.

Significant (P .01) gains were made in each of these areas. The smallest gain, understandably so, was achieved in the protection of wildlife. Predators represent a threat to the pastoralists' livestock and there is a stated desire to kill them all off. Consequently, whereas the sound effects of lion and hyena caused amusement and surprise of the listeners, the actual message of the programme was one of the least best received.

Objective 6 was to use the production of the radio programmes as an opportunity for discourse and further learning regarding the social and cultural values and of the Rendille pastoralists. Question 13 through 19 sought some of this information. Question 20 asked the respondent whether he or she would like to ask a question. Some interesting findings in this area were:

1. The Rendille value large families. 50% of the respondents indicated over ten children (or "as many as God will give") as being desirable.
2. They perceive the need for money, by indicating that they would value some of their children getting a wage-earning job elsewhere to help out.
3. When asked what kind of work they would like their children to do, 42.4% of the respondents answered, "go to school", and 33.7% answered, "some to look after animals and some to go to school".

They thus clearly indicated their feeling that school and keeping animals do not go together. This information has important implications, as it indicates that the education or training required to modify livestock management practices is not going to be effective if channelled only through the schools for it will not be reaching those who are actually keeping herds. This finding provides important evidence for the need to develop and implement adult education and training "environmental" courses and programmes.

4. Family ties are close. 49% of the respondents would like their children to live near them.
5. The illiteracy rate is very high. 77.8% of the respondents in the pre-radio and also 77.8% in the post-radio programme interviews had no schooling or only a few months of adult literacy. 96% and 5.3% of the respondents in the pre-radio and post-radio programme interviews respectively had between 1 to 7 years of primary education. 21.1% and 16.8% of the respondents in the pre-radio and post-radio programme interviews, respectively, had 7 years or more of schooling.

Questions 21 through 24 sought information regarding the use and ownership of radio sets by the respondents.

Of those interviewed before the radio programmes, only 11% had radios, and 89% did not. After the radio programmes, 24% of the respondents claimed to have radios. During the post-radio interviews, several respondents indicated they had bought or had radios repaired so that they could listen to the programmes. This indicates that it is possible that more people would buy radios if there were more programmes in their vernacular language.

In the post-radio interviews, 89% of the respondents said that they generally liked the radio programmes. 1% disliked them and 10% gave no opinion. 91% of the respondents stated that they had learned new things or that they found the programmes educational.

Before the radio programmes, 41% of the respondents said that they did not listen to the radio at all. 47% listened sometimes, and 12% listened every day. In the post-radio programme interviews,

74% listened sometimes (13% of them to the UNESCO radio programmes only), and 26% listened every day. This of course is largely due to the availability of the UNESCO radio in the interview sites.



Elder Dadio Arbele, Rengumo, showing 2 tree seedlings he is growing as recommended in programmes.

Generally, the findings indicate that the programmes have been very successful, and quantitative data show that real gains have been made in 5 out of the 6 main objectives of the programmes.

It has not been possible, with any real validity, to quantitatively measure any gains made towards the achievement of the other main objective which was "to sensitize decision makers in the area to the need for an integrated, comprehensive resource management

policy which takes all factors into account". However, the large degree to which decision makers in the area were involved in the production of the radio programmes (acting as custodians to the radios, helping oversee the programme evalutions, being interviewed for the programmes, participating in discussions, etc.) appears to have had a very positive effect.

Generally, this test case has shown that this medium of communication, with certain modifications, has a good potential for future educational endeavours in the study area.

EDUCATIONAL MATERIALS

Development of educational materials

Usually, the development of educational materials is part of the process of curriculum development. First, an instructional event is planned for a specific target group and its educator and then the type of materials or media are selected which will provide stimuli or help the instructional event take place.

Gagne and Briggs (1974) and Dale (1969), among others, offer various suggestions on methods for selecting the type of materials or media to assist learning.

After selection of the type, actual development of the specific materials requires checking for accuracy and appropriateness. Pretesting and consequent modifications have to be made before the materials can be used with confidence by the target group.

Although time was a great constraint, a start was made during this consultancy towards developing some IPAL educational materials.

1. Radio programmes for schools

The Rendille radio programmes were designed as part of IPAL's non-formal education component. The target group were the Rendille pastoralists. Nevertheless, through the education officer in Marsabit, a circular was sent to schools in the area, encouraging use of the programmes with Rendille-speaking pupils. Initial feedback from those pupils indicated that they were well received for use in the schools.

The scripts, translated into Swahili, with little modification, can be easily recorded and used for broadcasting to the general public (non-formal education), or incorporated into the schools' broadcasting programme.

2. Taped talks for slide/tape presentations

Six interviews with scientists talking at length on the main aspects of their investigations in simple English, were recorded, to be used as follows:

(i) for English programmes for general broadcasting use (non formal). or for possible incorporation into schools' broadcasting programme, and

(ii) for use in slide/tape presentations (slides available from "Science Communicators").

3. IPAL brochure

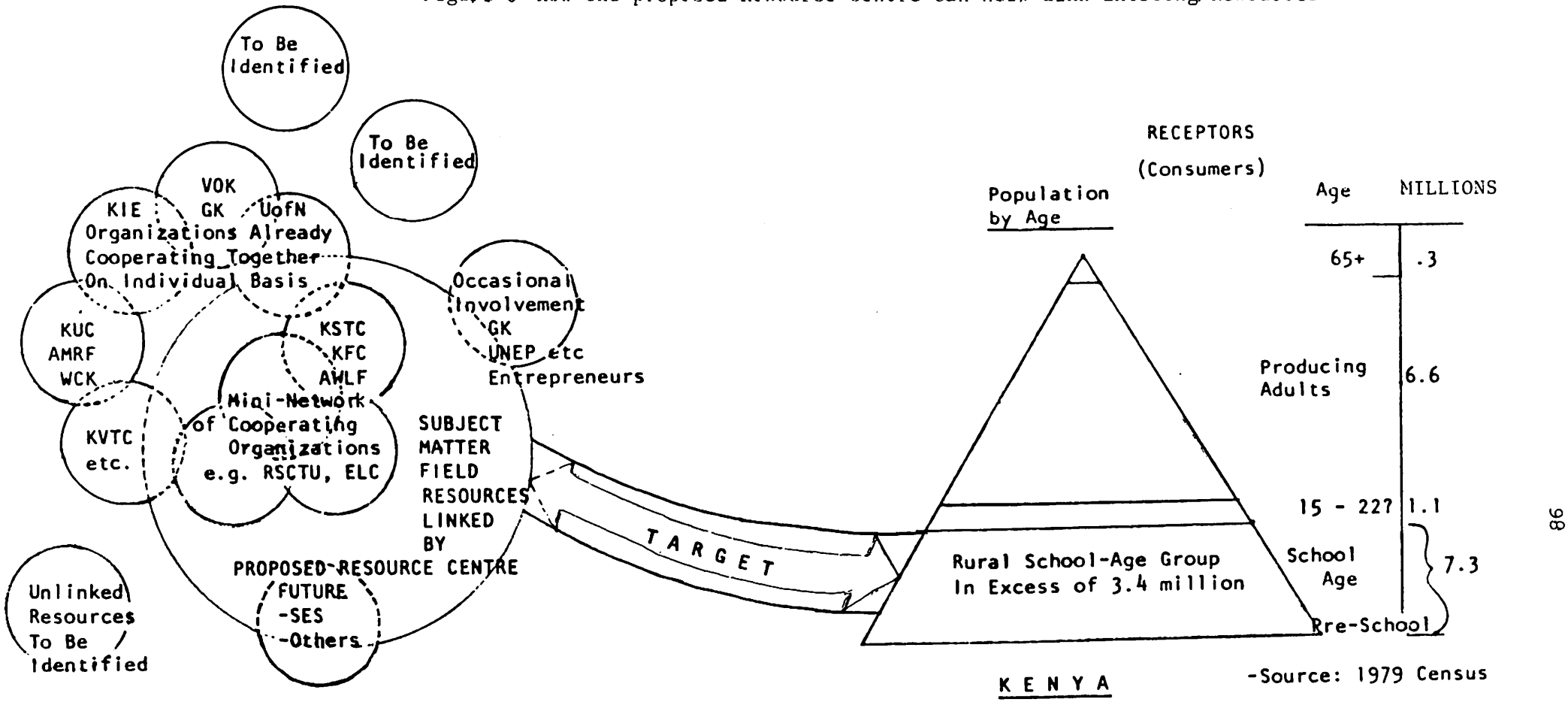
A brochure providing general information on all aspects of IPAL ... aims, objectives, approaches, accomplishments, etc. was produced for the general public, and can also be used as a basic information source in schools and institutions.

Participation in development of an environmental education resource centre

The idea of establishing an 'environmental resource centre' has been voiced in Kenya for some time and echoes recommendations made in meetings such as the Symposium on Environmental Education (Kenya), January, 1979, and The Africa Youth Leaders Training Course in Environmental Conservation Education (Kenya), July, 1979. In recent months, representatives of about 20 interested organizations (including IPAL) have been meeting, and it appears that there is considerable interest about the development of such a project. An interim planning committee was appointed to draw up an operational plan, and the following general concept was accepted:

> "To undertake activities in Nairobi, commencing in 1981, to improve the co-ordination, inventory, collection, production and distribution of a variety of materials (publications, posters, photographs, slides, films, video and audio tape recordings and any other appropriate media forms) to increase understanding of the environment/development inter-relationship; this would be for the benefit of various target groups within the general public audience in (initially) Kenya". (Report by IPC, 1971 p. 1).

Figure 6 How the proposed Resource Centre Can Help Link Existing Resources



Existing Relationships and Activities of Organizations in Environment/Development Field to be Seen as an Unperceived System Capable of Coordination, Rationalization

Source: Report of the Interim Planning Committee (IPC) for a Proposed Resource Centre (PRC), 1981

The first phase of the plan is to conduct a six month survey to identify all sources of material. Figure 6. shows how the proposed centre can help link existing resources. The main target group, initially will be the rural primary school-age group, but it is hoped that the services of the resource centre can continually expand to ultimately achieve a regional level if possible. IPAL's participation in this endeavour, which up to now has only consisted of support and consultation by the consultant, has been welcomed. It also benefits IPAL as this exercise will identify educational materials which may be used in the project's educational activities. In addition, the resource centre, when established, will serve as an excellent means to disseminate educational information in desertification and arid land ecology.

CONCLUSIONS AND RECOMMENDATIONS

Education

The educational institutions concerned with the environment, and through which IPAL input on arid land ecology and desertification can be made, have been identified in this report, along with recommendations for the type of input required in each case. The investigation revealed that there is a need for education on desertification, and that input from IPAL, through the appropriate channels, would be welcomed. In particular, there was an expressed need for educational materials.

Study has indicated that the IPAL input (environmental education) should be made at all levels of formal and non-formal education. This is in accordance with the United Nations Environment Programme recommendations (Johnson, 1980) as well as with the National Development Plans (see Appendix III) and Kenya educational policies.(Republic of Kenya, 1976). Nevertheless four high priority levels have been identified. They are: higher primary students (their curriculum is now being revised, and it is a large target group); decision-makers (who will need to develop and implement land management plans in the near future); the nomadic pastoralists themselves (now caught up in the problems of desertification), and the teachers in the study area (now influencing pastoralists' children).

Recommendations re education

1. That a general plan for target groups at all educational levels (with specific goals, resource allocation and time scheduling) be developed for the next phase of the Education, Training and Public Relations work of IPAL. (A suggested framework is presented in Appendix VIII).

2. That among the recommended discussions with various educational authorities and institutions, priority be given to discussions with the Kenya Institute of Education and the Kenya Institute of Administration to plan curriculum input for the higher primary level and government administrators' training programmes.

3. That a non-formal environmental education programmes on desertification and rehabilitation measures be developed and implemented for the nomadic pastoralists in the study area which will incorporate radio broadcasting and systematic use of a mobile unit, well equipped with various audio visual materials and manned by trained staff.

4. That a seminar be held for representatives of all educational institutions concerned with the environment to present IPAL (objectives, work and findings) and invite suggestions for integration of findings and desertification into their existing educational programme. This seminar can be followed by specific discussions with the various institutions and ministries concerned.

5. That IPAL continue to participate in co-operation with other agencies in the establishment of an Environmental Education Resource Centre.

6. That IPAL carry out a carefully controlled investigation to design a unit on desertification (including content, materials, teacher-training) for primary schools, and pilot test it in certain schools within the study area.

Public relations

Results of the first series of interviews indicated that around the study area field stations, the project is known and that relations with the people are good. However answers indicate that the project is known and appreciated mainly for the material benefits, e.g. assistance with jobs, transportation, water and medicine, that it brings to the area rather than for the research purposes of the project.

Areas far removed from the field stations are still not familiar with the project.

At the project headquarters (presently in Nairobi), there are frequent visitors e.g. travelling scientists and students who drop by to collect information on the project.

Recommendation re public relations

1. That a public relations component be integrated with the non-formal education programme (see Education) to systematically cover the study area with a mobile unit, and by use of radio.

2. That a slide/tape presentation be made available at project headquarters e.g. 'A trip to the study area' or 'IPAL' for use by visitors to headquarters.

3. That the function of disseminating information at IPAL headquarters be assigned to an education/public relations member of staff, who would refer visitors to the co-ordinator or appropriate scientists only when necessary, thus preventing unnecessary interruptions.

Communications

There are many communications problems in the study area. The roads are few and in poor condition, people are spread over a large area, and mass communication media are limited. This situation is exacerbated by the fact that a large majority of the population in that area is illiterate, and therefore cannot utilize printed media. In addition, there are various vernacular languages used in the area (Rendille, Gabbra, Samburu, Boran, and some Ariel, Turkana, and Somali). Not only does language tend to 'separate' people, but past tribal antagonisms and frequent livestock raiding in the present tends to create divisions among the tribal groups. Also social customs which keep men and women from participating together in events such as barazas add to the problems of communication.

Research shows that people in the area have learning needs that are not being met. Messages are often inappropriate or unacceptable, or sometimes do not reach their intended audiences. They are often one-way communications. Feedback is poor and follow-up is limited. There appears to be a real need for training in communications skills, specially for extension workers, and for more effective, co-ordinated use of resources, e.g. film vans and media production units.

Evaluation of a test case to assess the value of radio as a medium for communication with nomadic pastoralists indicated that, provided the limitations of cost of set, timing of programmes, and sometimes poor radio reception can be overcome, radio with follow-up discussion, may be a good means of communication in this area.

Interpersonal communication has been found to be the most commonly practised and best understood because it does not require literacy and can provide feedback. Other media for mass communication are either absent or very limited in the area. Cinema and still pictures are possible means which should be investigated.

Recommendations re communications

1. That IPAL encourage, or participate in some way (to be determined through co-operative planning) in some of the following activities:

- the development of simple materials on arid-lands for use in adult literacy classes or by new literates, e.g. a simple reader.
- the production of simple 'newsletters' to serve specific interests, e.g. women's groups, teachers, etc.
- the use of existing institutions e.g. district development committees, women's organizations, or co-operatives, for the distribution of material for specific target groups.
- liaison with Voice of Kenya (VOK) to make a regular input into existing radio programmes.

2. That in order to create greater interest in radio as a means of communication (help people who want to buy their own radios) and to maintain dialogue through radio, IPAL conduct an experiment whereby field assistants with tape recorders offer to record whatever elders in a manyatta jointly decide would be interesting or enjoyable enough to share with other Rendille. In other words, involve the people in programming.

3. That for future radio programmes more time to be allowed for pre-testing the material in the field (via cassettes) before it is broadcast and for training field assistants to conduct discussions.

4. That for future radio programmes, a support system (including background material and visuals, e.g. posters or pictures be provided for the follow-up discussion).

5. That IPAL liaise with the Education Media Service to incorporate the available radio programmes into the Schools Broadcasting Service.

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APPENDIX I

Educational Statistics from Central Bureau of Statistics

Primary School Enrolment by Provinces and Counties, 1975-1979

	1975	1976	1977	1978	1979*
Central Province					
Kiambu	145,918	151,518	160,071	165,738	176,895
Kirinyaga ..	65,233	66,381	64,785	71,766	79,614
Murang'a ..	150,916	153,339	156,840	165,944	179,484
Nyandarua ..	60,528	60,201	58,267	62,687	68,140
Nyeri ..	130,969	134,912	139,418	144,465	152,930
Thika Municipality	4,569	5,232	5,353	6,444	5,680
Total ..	558,133	571,583	584,734	616,064	662,741
Coast Province					
Kilifi	43,561	47,222	47,137	48,306	67,764
Kwale	33,150	33,374	33,823	34,211	44,924
Lamu	5,029	5,280	6,070	6,396	7,148
Mombasa Municipality	35,745	34,540	36,194	35,355	40,978
Taita/Taveta ..	30,838	31,188	31,944	35,241	39,802
Tana River ..	8,604	8,452	8,057	8,155	9,712
Total ..	156,927	160,156	163,225	170,664	210,328
Eastern Province					
Embu	55,822	57,525	61,151	63,980	71,822
Isiolo	4,138	4,598	4,403	4,485	5,120
Kitui	81,370	82,607	88,812	96,671	119,321
Marsabit ..	4,612	4,368	4,532	4,957	5,355
Masaku	247,152	249,318	255,419	264,017	279,893
Meru	152,783	144,806	158,318	167,741	207,116
Total ..	545,877	543,222	572,635	601,851	706,627
Nairobi Province	83,400	84,738	86,342	91,540	93,862
North-Eastern Province					
Garissa	2,625	2,761	2,680	2,733	3,128
Mandera	1,912	2,261	2,623	2,661	3,363
Wajir	2,428	2,485	3,931	4,093	4,099
Total	6,965	7,507	9,234	9,487	10,590
Nyanza Province					
Gussi	237,437	224,279	207,740	186,545	271,482
Kisumu County ..	104,430	84,443	86,861	90,957	123,980
Kisumu Municipality	6,175	6,190	6,304	6,526	7,650
South Nyanza ..	151,880	130,848	147,450	134,899	220,564
Siaya	106,973	104,820	106,095	99,419	143,572
Total ..	602,695	550,580	554,450	518,346	767,248

cont. APPENDIX I

Educational Statistics from Central Bureau of Statistics

Primacy School Enrolment by Provinces and Counties, 1975-1979

	1975	1976	1977	1978	1979*
Rift Valley Province					
Baringo	36,914	38,329	44,405	39,818	48,679
Nakuru	77,168	83,657	87,232	92,334	111,308
Nakuru Municipality	14,219	16,055	15,491	15,592	16,624
Kipsigis	114,297	130,248	130,670	137,152	168,266
Laikipia	19,236	20,470	22,264	25,022	29,550
Narok	15,494	15,810	16,935	19,014	23,694
Olkejuado	15,641	17,101	19,213	20,213	23,189
Samburu	3,970	4,464	4,683	4,836	6,216
Elgeyo Marakwet ..	32,234	33,925	33,264	34,781	41,570
Nandi	59,960	61,489	63,442	58,344	76,167
Trans nzoia ..	38,311	39,050	42,963	44,915	63,061
Uasin Gishu ..	43,929	47,071	50,948	53,646	64,361
West Pokot	10,823	11,820	13,418	13,142	18,269
Turkana	3,491	3,340	3,610	4,072	4,344
Eldoret Municipality	4,158	4,503	4,695	4,913	6,111
Kitale Municipality	4,854	4,314	3,699	3,973	4,268
Total	495,699	530,646	556,948	571,667	705,992
Western Province					
Bungoma	116,253	114,622	122,270	124,602	151,194
Busia	57,032	56,404	57,102	56,152	81,682
Kakamega	257,974	275,159	267,909	234,521	306,882
Total ..	431,259	446,185	447,281	415,275	539,758
Total ..	2,881,155	2,894,617	2,974,849	2,994,894	3,697,146

Source: Ministry of Education

* Provisional

SCHOOLS

By Type, 1971-1979

Number

	1971	1972	1973	1974	1975
Primary	6,472	6,657	6,932	7,706	8,161
Secondary	809	949	964	1,019	1,160
Teacher Training	27	25	9	18	18
Technical	10	9	10	10	10
Total	7,218	7,640	7,927	8,753	9,349

Cont. Table 197

	1976	1977	1978	1979
Primary	8,544	8,896	9,349	9,622
Secondary	1,268	1,473	1,773	1,711
Teacher Training	19	19	20	20
Technical	13	13	15	16
Total	9,843	10,401	11,157	11,369

Source: Ministry of Education

PUPILS ENROLLED

By Type of School, 1971-1979

Table 198

Number

	1971	1972	1973	1974	1975
Primary	1,525,498	1,675,919	1,816,017	2,705,878	2,881,155
Secondary	140,722	161,910	175,325	195,832	226,835
Teacher Training	8,628	8,683	8,905	8,864	9,154
Technical	3,051	3,214	3,525	3,659	5,468
Total	1,677,899	1,849,726	2,003,772	2,914,233	3,122,612

Cont. Table 198

	1976	1977	1978	1979
Primary	2,894,617	2,974,849	2,994,894	3,698,2 46
Secondary	274,838	313,977	354,452	370,703
Teacher Training	9,187	8,924	9,011	9,906
Technical	6,121	6,333	7,170	7,607
Total	3,184,763	3,304,083	3,365,527	4,086,462

TEACHERS IN SERVICE

By type of School, 1971-1979

Table 199 — Number

	1971	1972	1973	1974	1975
Primary Schools					
Trained Teachers ..	37,617	41,599	43,925	52,132	54,823
Untrained Teachers ..	11,779	11,937	12,618	26,208	31,284
Secondary Schools					
Trained Teachers ..	3,907	4,469	4,750	--	--
Untrained Teachers ..	2,464	2,637	2,638	--	--
Teacher Training Colleges					
Trained Teachers ..	605	627	578	671	601
Technical Secondary Schools					
Trained Teachers ..	175	204	231	--	--
Untrained Teachers ..	7	4	6	--	--
Total ..	56,554	61,477	64,746	79,011	85,708

cont. Table 199

Number

	1976	1977	1978	1979
Primary Schools				
Trained Teachers ..	56,145	59,640	63,912	68,361
Untrained Teachers ..	32,929	30,124	28,134	24,401
Secondary Schools				
Trained Teachers ..	6,460	6,727	7,399	7,394
Untrained Teachers ..	4,978	5,969	6,887	7,237
Teacher Training Colleges	639	661	683	692
Technical Secondary Schools				
Trained Teachers ..	--	--	329	343
Untrained Teachers ..	--	--	51	60
Total ..	101,151	103,130	107,395	108,488

Source: Ministry of Education

PUPILS ENROLLED

Secondary Schools by Form, 1978-1978

Table 202 (a)

	1978			1979		
	Male	Female	Total	Male	Female	Total
I	59,160	45,573	104,733	60,618	46,709	107,227
II	63,409	46,482	109,891	55,211	41,041	96,252
III	45,670	28,961	74,631	52,533	36,101	88,634
IV	38,769	21,251	60,020	44,416	26,059	70,475
V	5,027	2,012	7,039	5,877	2,691	8,568
VI	4,070	1,461	5,531	4,908	2,246	7,154
Total	216,105	145,740	361,845	223,463	154,847	378,310

Source: Ministry of Education

SECONDARY SCHOOL ENROLMENT BY PROVINCE AND SEX

1976-1976

Table 202 (b)

	ENROLMENTS '000s			
	1976	1977	1978	1979
Central	66.7	78.2	87.4	94.7
Coast	16.5	19.0	19.6	20.7
Eastern	45.1	54.5	63.2	67.0
Nairobi	28.0	29.5	31.4	25.2
North-Eastern ..	0.6	0.7	0.7	0.1
Nyanza	46.1	50.5	62.4	65.5
Rift Valley ..	34.5	40.8	46.7	51.8
Western	42.8	47.1	50.3	49.9
Total	280.4	320.3	361.7	378.3
Girls	103.7	122.8	144.7	154.8
Boys	176.7	196.5	217.0	223.5

cont.

SECONDARY SCHOOL ENROLMENT BY PROVINCE AND SEX,

1976-1979

Table 202 (b)

	FORM 1 ENROLMENT AS PERCENTAGE OF PREVIOUS YEARS' STANDARD 7			
	1976	1977	1978	1979
Central	43	48	46	45
Coast	40	44	45	39
Eastern	33	43	44	40
Nairobi	90	85	77	68
North-eastern ..	33	30	25	40
Nyanza	36	35	41	36
Rift Valley ..	35	35	35	41
Western	50	47	45	41
Total	42	44	44	--
Girls	43	45	46	--
Boys	41	43	43	--

Source: Ministry of Education

APPENDIX II

Recommendations with Educational Implications from IPAL Technical Reports

Project No.	Project Title	Topics	Education/Training Recommended
E-3	Impact of Human Activities on Land Use Practices on Grazing Lands.	Livestock Management:	
		Range Management	- Training local personnel in basic management.
		Marketing	- Train marketing officers.
			- Help people diversify livestock economy.
		Hides	- Train people to produce leather commercially.
		Veterinary Care	- Train veterinary personnel who move with nomads, treat animals, and report disease out-break.
E-4	Effects of Large Carnivores on Livestock.	Protection of Herds	- Teach people how to use dogs effectively.
E-1a	Ecology and Management of Camels, Sheep and Goats.	Management	- As in E-3
E-1b	Food Habits of Camels.	Camel Management	- Train pastoralists to more full exploit the advantages of camels.
D-2a	Protection of Montane Forest	Forestry	- Provide basic training in forestry, and in erosion control.
A-3	Proceedings of Scientific Seminar, Nov. 1981.	Education	- Train field educationalists to use various media to promote range conservation.
D-2b	Prospects, Problems and Proposals for Tree Planting.	Tree-planting	- Teach and demonstrate techniques of raising and tending plants.

APPENDIX III

References in Development Plan 1979-1983, Part I Educational Policies and Management of Arid Lands.

Topic Heading	Page No.	Section No.
Rural Development	14	1.52 - 1.53
The Target Groups	22	2.1 (i)
Constructive Social Change	25	2.20
Employment Opportunities	35-39	2.60 - 2.74
Income Policies	41	2.81
Land Use	54	2.125
Environmental Management Policy	59-61	2.141-2.155
Education	103	3.54-3.56
Food and Nutrition	146	5.82 (iii)
Food and Nutrition	148	5.86 (iii) & (iv)
Education Policy	152-169	5.93-5.147
Family Life Training Centres	184	5.196
Adult and Continuing Education	186-187	5.2-5.208
Youth Development	187	5.209
Livestock Development Services	243-246	6.1-6.114
Arid and Semi-arid Lands Dev. Prog.	253-255	6.14-6.147
Foresty Development	267-268	6.192-6.194
Forestry Research	274-275	6.213-6.215
Education and Training (Forestry)	275	6.217
Education and Training (Geology)	279	6.228
Manpower Requirements and Training	295	6.271
Education and Training (Cooperatives)	315	6.311
Tanneries and Leather Finishing	363	7.120-7.122
Education and Training (Wildlife)	405	7.293-7.296
Environmental Impacts	449	8.147
Information and Broadcasting	462-463	9.41-9.46
Training (Manpower)	483	10.9
The Training Network (Manpower)	484	10.10-10.13
Training for Extension Services	487	10.21-10.22
Training Programme for Govt. Employees	487	10.23
Training in the Private Sector	488-489	10.25-10.32
Development of the Arid and Semi-arid Lands.	496	10.57-10.59

APPENDIX IV

Estimates of Recurrent Expenditure on Education and Training by All Ministries, 1976/77

Ministry		Net Expenditure in K£'s	Percentage of Total
Education		69,840,000	86.3%
Office of the President ..		1,806,000	2.2%
Health		1,476,000	1.8%
Agriculture		1,154,000	1.4%
Labour		1,040.000	1.3%
Home Affairs		945,000	1.2%
Housing and Social Services ..		636,000	0.8%
Works		208,000	0.3%
Tourism and Wildlife		168,000	0.2%
Natural Resources		166,000	0.2%
Commerce and Industry ..		148,000	0.2%
Information and Broadcasting ..		138,000	0.2%
Co-operative Development ..		92,000	0.1%
Office of the Attorney-General ..		80,000	0.1%
Water Development		41,000	-
		77,938,000	
Local Government*		3,000,000	3.7%
TOTAL, EDUCATION AND TRAINING	(1)	80,938,000	100.0%
TOTAL ALL GOVERNMENT	(2)	248,348,000	
(1) as percentage of (2)		32.6%	

Source: Report of the National Committee on Educational Objectives and Policies, 1976, page 172.

APPENDIX V

Sample of One Radio Programme

Radio Programmes

Number: 4

Title: The Lion and Lengima

Purpose:

1. To cite an example of one way in which man, his livestock, and wildlife inter-relate.
2. To point out that man competes in the environment for resources.
3. To highlight one important common problem of all people who keep herds, that is, protection of the herds from predators.

Approach:

A story told by Lemayan Lengima, a herd-owner, about an encounter with a lion, while herding.

Evaluation:

1. Self evaluation - the listener attempts to answer brief questions at the end of the programme to see whether the main points have been grasped.
2. Independent evaluation - an evaluator rates the quality of radio reception, observes the reaction of listeners, and notes their comments.

Programme 4: script

The Lion and Lengima

(Sound effects of a herder, driving his herd)

Presenter

Have you noticed how every living thing in our environment (surroundings) needs other things? Man cannot live alone. He is a part of his environment.

For example, plants need water to grow. Our livestock need plants to live. We people need our livestock for food. However other people or wildlife in our surroundings may also need the same water or plants or livestock in order to stay alive. So we protect these things for our own survival.

Today Lemayan Lengima, a herd owner from Ngurunit area tells us a story about one time when a lion wanted his livestock.
(sound effects of a herder, driving his herd)

Lemayan Lengima:

(Tells his story of the lion who came after his animals, and how he chased it away).

Presenter

Questions and Answers:

1. How did Lengima protect his herd?
   He chased away a lion who wanted to eat some of his animals. The cost he was paying for this protection was the risk of his own life, for the lion could have attached and even killed him.

2. What is another way in which herders protect their livestock from wild animals?
   Herders build "bomas" (enclosures) to enclose the animals at night. These bomas are built of thorn trees, specially the Acacia tortilis which has large thorns.

3. What is the cost (or sacrifice) of building "bomas"?
   The cost is that trees have to be cut down and destroyed to build "bomas". The environment pays the cost. First the trees pay with their lives. Next, the animals pay, for they will have less trees to feed on. Then, later on, man pays by not having such well-fed livestock. We all depend on one another.

APPENDIX VI

EVALUATION FORM - RADIO PROGRAMME

Date of Programme _____ Place _____
(Name of Manyatta)

Name of Assistant _____
(the evaluator)

1. RADIO RECEPTION - How well can you hear?

(tick one) GOOD _____ FAIR _____ POOR _____

2. NUMBER OF LISTENERS

How many adults _____

How many children _____

3. REACTION OF LISTENERS - What do they do?
(Tick one or more)

Listen carefully _____ Laugh _____

Talk during the programme _____ Walk away _____

Discuss or ask questions at end of programme _____

*4. COMMENTS OF LISTENERS - What do they say?

*5. COMMENTS OF ASSISTANT (The evaluator)

* (use back page if needed).

APPENDIX VII

Interview Schedule

1. Have you heard of UNESCO?
2. Do you know what UNESCO is doing here? (explain a little)
3. Do you think UNESCO is good or bad? Why? (or neutral)
4. What are some of the things you get from your surroundings which help keep you and your family alive?
5. Do you think too many trees are being cut?
6. Do you think there are more or less plants here now than when your parents were children?
7. If herds eat all the plants in an area and leave the gound hare, does it hurt the land? (if answer is "yes", How?)
8. Can anything be done to stop cracks in the ground from getting bigger, or does it just happen?
9. Is there anything you are doing to protect or improve the soil?
10. Is there anything you are doing to protect or improve the plants?
11. Is there anything you are doing to protect or improve the wildlife?
12. Is there anything you are doing to protect or improve the water.
13. Do you think there is something the government or anyone can do to improve the living conditions of the nomadic pastoralist? If so, what?
14. What do you consider is a good number of children for a man and wife to have?
15. What would you like your children to live?
16. Where would you like your children to live?
17. Did you go to school? How long?
18. Do you wish you had more schooling? Why?
19. Which is your biggest problem in using the land for herding animals?

20. Do you have a question?
21. Do you listen to the radio? (no, sometimes, or every day?)
22. Do you own a radio?
23. Where do you listen?
24. To what do you like to listen? (music, news, other)
25. What languages can you understand on the radio?
26. The Thorn Tree (Acacia) is very useful. Make a list of those (people and animals) who use it.

APPENDIX VIII

SUGGESTED FRAMEWORK FOR NEXT PHASE OF IPAL EDUCATION, TRAINING AND PUBLIC RELATIONS WORK

General Purpose:

1. Sensitization - (make people aware of the problem of desertification).
2. Information - (Disseminate facts)
3. Understanding and knowledge - (Provide opportunities for exchange of ideas, value clarification, etc.)
4. Motivation to act - (Point out avenues and provide guidelines).

Objectives:

1. To make an input into the curricula of:
   (a) Educational Institutions of higher education concerned with the environment, e.g. - Agricultural Colleges, Science Teachers' College, University of Nairobi, Kenyatta University College, Technical Institutes, Teachers' Training Colleges.
   (b) Administrators and decision makers programmes
      (i) Government district headquarters.
      (ii) Kenya Institute ofAdministration.
2. To make an input into the school curricula at all levels, primary, secondary and adult literacy.
3. To begin non-formal education programmes for the
   (a) nomadic pastoralist in the study are.
   (b) general public of Kenya.
4. To help create positive attitudes towards ecological studies and good will for the project.

Methods:

For Objective 1.

- Dissemination of brochure and of reports, where appropriate.
- Use project staff as speakers and resource people.
- Seminars.

- Teacher Training workshops (to teach simple techniques to promote field studies).
- Slide/tape materials on specific topics or problems in arid lands.
- Other audio visual materials (which may be provided on loan) e.g. flip charts, educational games, posters.
- Field trips to the study area.
- Provide list of priority research areas to stimulate more local participation.

For Objective 2.

- Simple audio visual materials for primary schools and adult literacy programmes, e.g. simple readers, flip charts, games, posters, etc.
- Modules (units of work) on various aspects of IPAL's work. These may be developed for primary and/or secondary level.
- Radio programmes in English which could be broadcast over schools Broadcasting Services (integrated into their existing science and geography programmes.

IPAL Consultancy Report

Training and Education within the Integrated Project on Arid Lands in Northern Kenya

Nairobi, 4 August - 2 September, 1981

Drafted by
Fouad N. Ibrahim
Professor of Geography
University of Bayreuth
Federal Republic of Germany

TERMS OF REFERENCE

The terms of reference used in order to devise a programme of training and education within IPAL, Kenya, are:

1. To study Kenya's education curricula and to design a comprehensive programme of training and education so that IPAL can complement existing Governmental activities for semi-arid regions of the country.

2. To suggest modes of presentation of IPAL material, e.g., in illustrative graphics or other suitable format, for all levels of education.

3. To study IPAL's results and documentation and to determine their relevance to the different educational levels of the project audiences including pastoralist communities.

CONTENTS

Terms of reference	130
Summary of recommendations	131
Target groups	134
Primary schools	135
Secondary schools	159
Tertiary level	186
Adult education	190
References	194

SUMMARY OF RECOMMENDATIONS

1. In order to be able to combat desertification effectively education and training in the problems of arid lands management and the deterioration of natural resources as a result of land misuse in the arid and semi-arid zones must be conducted at all levels, but especially at the primary school and adult educational levels of the people affected.

2. IPAL is unable to carry out education and training programmes at all desired levels. The major constraints in this respect are:

(a) The lack of senior educationalists in IPAL, especially in the fields of geography and biology, the two main subjects which cover environmental education.

(b) IPAL findings as published in the "Technical Reports" need considerable modification in order to be of general interest to teachers and pupils and to become suitable for educational purposes.

(c) IPAL findings are limited to an arid, pastoralist environment. General environmental education relating to the problem of the degradation of arid lands should, however, include the arid and semi-arid areas under cultivation in Africa in general and in Kenya in particular. A review of the present curricula and the school books in use shows that environmental problems are tackled at a more general level and less at a local one.

3. It is recommended that, in future, IPAL should be engaged in education and training activities both directly, i.e., by involving itself in actual implementation, and indirectly, i.e., by helping educational institutions and the decision-makers at the Ministry of Education.

4. Direct education and training activities can be done in the following fields:

(a) Adult education in the IPAL area. (Fortunately, a Boran teacher from the area has been engaged recently for this work.)

(b) Seminars can be held at Marsabit every six months for different target groups such as: extension officers, teachers, students, post-graduates doing research and scientists from East Africa.

5. Indirect education and training activities should embrace:

(a) Producing a series of slides on different aspects of resource management in arid lands. Each slide series should be accompanied by a leaflet for the user.

(b) Designing posters showing the subjects in (a) for use in areas where no slide projection is possible.

(c) Negotiating with The Voice of Kenya to organize a team to take over the production of radio programmes on the problems of arid lands management. IPAL scientists should sponsor that radio team and provide it with relevant themes and scientific consultancy.

(d) Writing text books for teachers and students based on IPAL findings on relevant subjects such as:
Overstocking;
Nomads and their settlement;
Livestock marketing;
Excessive tree-felling and its consequences;
The fragile ecosystem of arid lands;
Desertification, its causes and consequences;
Tradition and the environment in Kenyan dry lands.

(e) Devising learning units on arid environments to be used by Kenyan teachers.

(f) Participating in setting the curricula of science (biology) and geography of Kenyan schools.

(g) Participating in writing school books, e.g., in collaboration with the Jomo Kenyatta Foundation.

Except for testing purposes, IPAL is not advised to go into actual implementation or mass-production of teaching media, but to hand over its results and designed media to be reproduced and propagated by the relevant Governmental institution.

6. In order to be able to carry out all the above-mentioned activities two part-time Kenyan experts on the teaching of biology and the teaching of geography, together with the currently engaged assistant, should be engaged, thus strengthening the personnel of IPAL.

7. Dr Irma A. Allen has compiled and presented some valuable information on training and education in this field. This has made it possible for me to leave out the general subjects which she has discussed, and to concentrate more on developing learning units and giving illustrations of how scientific material can be modulated into educational programmes.

TARGET GROUPS

Environmental education and training should be implemented at different levels of education. The most important level, however, is that of public education. For any attempt to combat desertification will fail if the population concerned is not involved and is left ignorant of the causes and consequences of environmental deterioration and the methods of protection, conservation, and rehabilitation.

Education and training at the following levels will be discussed here:

1. Primary schools.
2. Secondary schools.
3. Teacher training institutions.
4. University research work.
5. School of environmental studies.
6. Adult education (for literate and illiterate adults).
7. Seminars for extension officers, decision makers, teachers and curriculum makers (e.g., Kenya Institute of Education).
8. International orientation seminars for Kenyan and regional scientists from the Sudano-Sahelian region.

The methods of implementation suggested for the various levels represent rough work strategies which could be refined and adapted to the specific group of learners and the specific environment. The fact that IPAL has been carried out in an exclusively pastoralist environment will make us pay special attention to transhumance range management, though cultivation problems in dry lands will not be excluded.

PRIMARY SCHOOLS

Recommendations for teaching the subject of "Land use problems in dry lands"

I. Didactical relevance

In Kenya, approximately 75% of its land surface, and 15% of its population, is threatened by desertification. Therefore, it is of national interest that all citizens should be acquainted with the problems of the arid and semi-arid environment in their country. Environmental education is, in fact, emphasized in all primary educational objectives and plans of the Kenyan Ministry of Education:

1. According to "Kenya syllabus of Primary Schools - Geography" (Nairobi 1975, page 1), one of the major objectives of primary education is: "To develop awareness and understanding of his (the learner's) environment."
2. In the same reference, "Transhumance (Nomadism and semi-nomadism") is given as the first main theme for the Primary standard IV which is concerned with the "Ways of life in some parts of Africa."
3. For the Primary standard V, "Hot and cold deserts" are among the subjects treated under the main topics: "Regions, climate and vegetation."
4. In the Primary standard VII, which deals with Africa, arid lands are to be tackled under the topic: "Natural vegetation regions". There is also an item on "livestock : cattle, sheep, camels, goats", which can well fit in with land use in arid lands.
5. In the "Science" syllabus for primary schools (1976), environmental perception and ecological knowledge are among the main objectives. For standards I, II and III it says "develop certain skills such as those of careful observation and the comparison and classification of materials from their environment."

6. "Weather and soil" are science topics for standards IV and V.
7. Among the themes for standard VI is "A study of the environment." It is stated: "A number of relationships between living things and their environment should be examined by children. Children should also develop the concept that man's activities have far-reaching effects on the environment."
8. In the "Primary Education Project - Development of Kenya Primary Education Curriculum - Statement of Objectives," Kenya Institute ofEducation, Nairobi (1978), environmental study occupies a central place in Sciences and Social Studies:

Sciences (page 62)

"A. Land utilization in their (the learners') environment:
Specifically: The learners will be better able to:
Observe and analyse soil conservation practices.
Observe and record soil erosion sites.
Analyse the effects over a period of time.
Map the land in relation to how it is used for livestock and crop production, homesteads, forests, animals, etc.
Practise appropriate cultivation and soil conservation methods in relation to crop rotation, fencing, soil cover, etc.

B. Water utilization in their environment.

C. Food production.

D. Conservation and utilization of energy and other resources."

Social studies (page 74)

"Learner should be able to:
Identify problems in his environment.
Identify the potential use of local resources.
Acquire and use skills for the study of the environment e.g., map reading and interpretation.
Acquire the correct attitudes and values for the conservation and improvement of the environment.
Understand the relationship of environmental factors for individual, national and international development.

Utilize, manage and conserve the environment to meet individual, national and international needs.
Understand and appreciate the importance of local, national and international cooperation in the use of the environment."

II. Objectives

Clearly environmental problems are of central importance in the curricula of the Kenyan primary schools. If one takes the arid and semi-arid environments, the objectives can be specified as follows:

1. Children should acquire knowledge and perception of the factors which control the arid environment.
2. Children should understand the natural and human causes of the problems of dry lands.
3. Children should learn how to develop ideas for alternative land use methods which are better adapted to the limited natural resources of the arid environment.
4. Children should develop the will and readiness to participate in measures to combat desertification.

III. Methodological approaches

A decisive factor in the choice of appropriate material and method is whether the learners live in and have first-hand experience with arid and semi-arid environments. Children of the humid zone would not be able to draw upon direct observation in their own surroundings and would have to depend on pictures and oral and written information. But children of the arid environment can step out of the classroom and observe these conditions directly. Yet they would not really understand how dry their natural environment is unless they saw scenes of the humid zone.

Some methodological proposals are made below by way of illustration:

A. A poster of desertification.
B. Project work: Survey on desertification through overgrazing and excessive tree-felling in a nomadic and semi-nomadic environment.
C. Role playing: How to stop desert creep.

Other methods which could also be recommended are outdoor observation and mapping environmental features which are relevant to desertification such as trees, grass patches cultivation, sand-dunes, etc.

A. *A poster of desertification*

Subject: The process of desertification.

Target group: Primary school children from 8 to 14 years old.

Objectives

1. To understand the components of dry environment (climate, vegetation, soil, water) and the interaction among these components.
2. To understand that man can destroy his own natural environment, which provides the basis of his own existence, by excessive or wrong land use, such as overgrazing, overcultivation and excessive wood cutting.
3. To understand the process of desertification and recognize its indicators, such as the thinnning of the plant cover, increase of soil erosion, formation of sand dunes, change of surface run-off.
4. To realize that economic and social problems, such as lack of food, firewood and timber, hunger, death of herds, poverty, sickness, compelled population migration and unemployment can be the result of desertification which, in turn, results from the misuse or overuse of land.
5. To acquire an awareness of the hazards to which an arid environment is subjected.
6. To be willing to participate in the protection, conservation and rehabilitation of arid and semi-arid environments.

Methods

By using the poster of desertification the teacher can conduct a learning unit ranging from 1-3 periods, depending on the significance of this subject within the syllabus. If the learners are actually living in an arid environment, the teacher could take them out of doors in order to make them aware of their enviornment,

components of which are illustrated schematically in the poster.

The poster illustrates 3 stages of environmental development:

Scene 1: the ecological system of semi-arid lands in an undegraded condition.

Scenes 2a and 2b: the same environment subjected to unadapted or excessive land use practices.

Scenes 3a and 3b: the result: the desertified environment.

The teacher could either show the poster as a whole chain of events asking the children to reconstruct the "story" of the environment; or the teacher could work systematically from picture to picture asking questions and eliciting pupils' comments, thus enhancing their understanding of the components of the arid environment and the causes and consequences of the desertification process.

Scene 1: The undergraded semi-arid ecological system

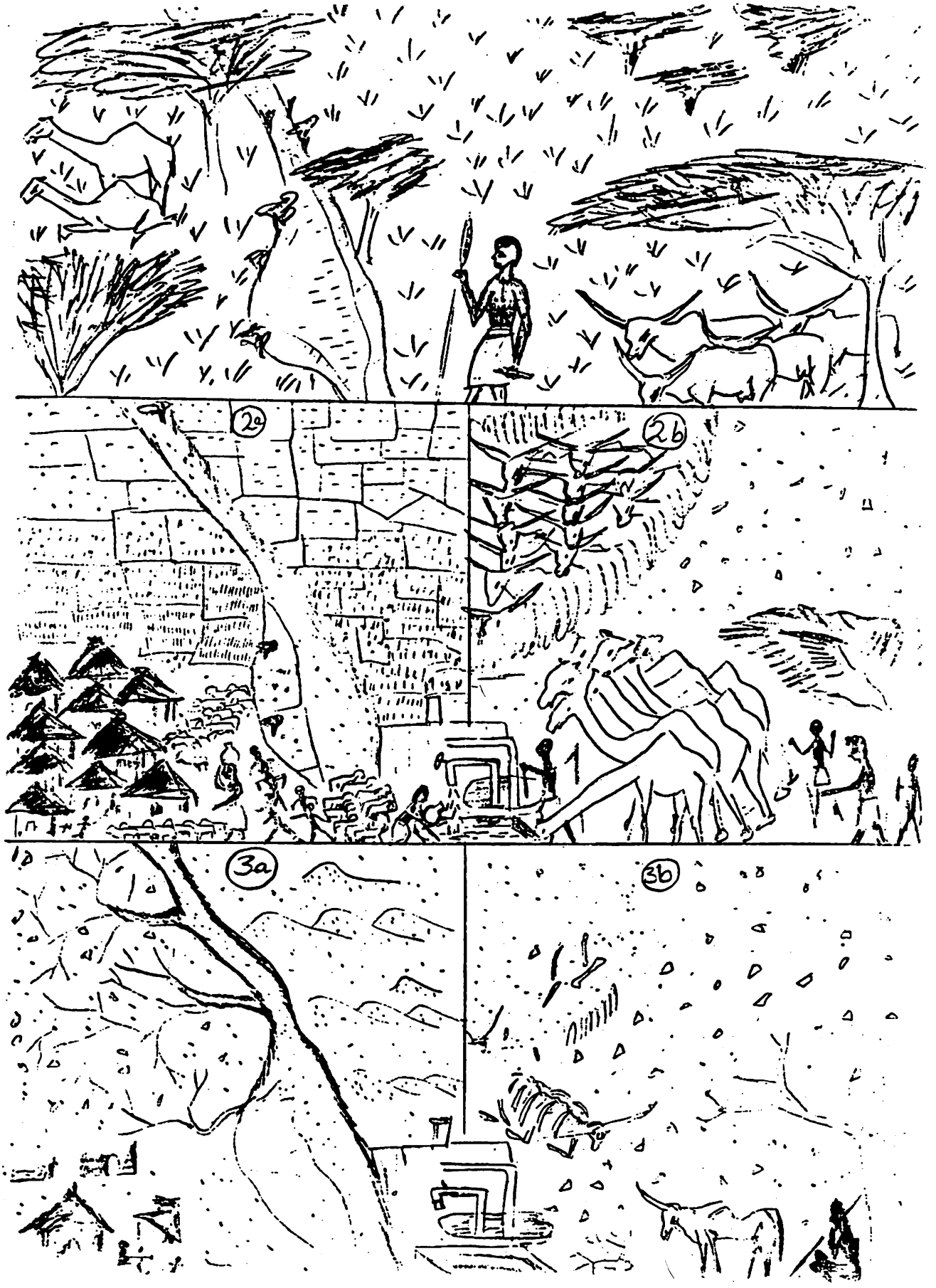
Questions

1. Can you say something about this picture?
2. How many trees and bushes are there?
3. What are the trees like?
4. What are the grazing conditions like?
5. How many animals are grazing?
6. What is the conditions of the cows and camels?
7. Where do they get drinking water?
8. Is this grazing land seasonal or used all the year round? Why?
9. What do the herders do in the dry season?
10. Is this herdsman happy? Why?

Scene 2a: Excessive cultivation

Questions

1. What change has taken place here?
2. What field-crops do the farmers grow here?
3. How many trees are left?
4. What is the condition of the pasture?
5. What is the condition of the animals?
6. How many families live on that land?


2a
2b
3a
3b

7. Do the people move in the dry season?
8. Are the people happy? Why?

(The last question can be answered positively or negatively. It is an important question to ask, so that the teacher can acquire a knowledge of the learner's perception of and disposition towards living conditions in his environment.)

Scene 2b: Overgrazing

Questions

1. Compare the situation in scene 1 with that in scene 2b.
2. How many animals and how many people can you count in scene 2b?
3. What are the grazing conditions like?
4. How many animals are there to feed?
5. What is the condition of these animals?
6. What can you say about the soil?
7. What is the source of drinking water?
8. Do these herders move from place to place the whole year round? Why?
9. How many people are there?
10. Do you think everybody is happy? Why?

Scene 3a: Desertification in overcultivated land

Questions

1. Compare scenes 2a and 3a.
2. What has happened to cultivation?
3. What has happened to the land to the right of the valley?
4. Where does the sand (and dust) of the dunes come from?
5. What has happened to the land left of the valley?
6. Why has the settlement become smaller?
7. Are the people happy? Whay?

Scene 3b: Desertification through overgrazing

Questions

1. Compare scenes 1 and 3b.
2. How many trees and bushes are in scene 3b?
3. What is the grass cover like?

4. What has happened to the soil?
5. What is the water supply like?
6. Describe the condition of the people and animals.
7. How many of them are there?
8. Is the herdsman happy? Why?
9. Do you think that the conditions in scene 1 can be recovered? If yes, how?
10. If one could return to the conditions of scene 1, what would you do to keep it always as good as that? (If the learners attribute ecological degradation to drought, the teacher should accept this answer, but he should, at the same time, remind them of man's impact as seen quite obviously in scenes 2a and 2b.)

Suggested subjects for homework or evaluation questions.

1. Write three things a pastoralist should do and three things he should not do to keep the pasture in good condition.
2. If you were a herdsman in dry lands would you keep all the young animals that were born every year or would you sell most of them? Why?
3. If you lived in a dry area, which would you prefer to do?
   (a) Till the soil and plant grain.
   (b) Keep a small herd of goats.
   (c) Make and sell charcoal.
   (d) Go to the nearest town to live with some relatives, without working at all. Give reasons.
4. Draw a picture of a good pasture.
5. Write (or say) 4 sentences describing an area which has been desertified. (What are the plants, soils, animals and people like?)

B. *Project work:* Desertification through overgrazing and excessive tree felling, by Gufu Oba.

Target group: Primary Vi (12 - 14 years).

Objectives: By using questionnaire techniques pupils will find out:

a) how man contributes to the processes of desertification through overgrazing and excessive tree felling;

b) the effects of desertification on animal husbandry.

Instructional objectives: By the end of the exercise, the pupils should:

a) present the results in a tabular form;
b) be able to answer questions on the human and animal impact on trees and dangers of over-grazing;
c) be aware of the vulnerability of their environment and be more ready to protect its natural resources.

Introduction

This project will be a questionnaire compiled by the pupils. The project should be interdisciplinary and should involve several of the teachers who teach that particular class. Teachers of language may, for instance, help in the descriptive part of the questionnaire and questions, the mathematics teacher will assist in calculations, construction of tables and graphs, if any. The geography and science teachers may also coordinate their exercises. Though the exercise involves various teachers, it should not be seen as juxtaposition of exercises, but as a single exercise that involves all the teaching and learning apparatus inside and outside the classroom. By this approach the exercise will be more meaningful to the pupils, because they will see the importance of all subjects in the process of conservation as well as helping them to realize the seriousness of the problem of desertification.

The survey is better carried out among nomadic and semi-nomadic communities in arid and semi-arid areas.

First the teachers should explain to the pupils how the questionnaire can be used to gather the required information. Pupils working in groups are sent to nearby homes to interview the people using the questionnaire forms provided. A teacher may be assigned to specific groups to assist in carrying out the questionnaire.

Pupils show their answers by marking an "X" against the response to each question; where names of trees are required the children can write them down in vernacular in the appropriate spaces.

After the exercise the pupils should construct tables and fill in the information gathered per household helped by their teachers. They should then study their compiled results and answer the questions at the end.

The suggested questionnaire is trying to be very comprehensive, thus teachers can skip some of the questions or add new ones according to the requirements of their environment.

If desired, the questionnaire may be divided into two smaller sections; the first section (questions 1-17) on livestock, the second section (questions 18-35) on wood consumption.

The questionnaire may also be translated into the easiest language which the pupils can express themselves in.

Evaluation

When the exercise is completed the teacher can help the class to construct the appropriate table and feed in their information. Using these results the teacher can question the pupils. The class response to these questions will reflect how far the stated objectives have been achieved. It is recommended that the pupils answer these questions in small working-groups before discussing the answers in the class as a whole.

Evaluative questions

1. What is the average number of animals that died of disease and lack of fodder for each family?
2. Calculate the average numbers of goats, cows and camels. Which of the three animals had the highest death record owing to disease and lack of fodder?
3. A herd of cattle usually leaves home before sunrise and reaches the grazing area just before the afternoon. Why?
4. Why do pastoralist families keep large numbers of animals?
5. On the average, which animals give more milk, cows or camels?
6. Some families sell their milk to buy other foodstuff. Why?
7. A woman leaves home to fetch firewood early in the morning and comes back in the afternoon. What can you say about the supply of firewood near the home?
8. A household uses "a wood-load" of firewood for a week. If a "wood-load" weighs 10 kg on average how many kilograms of wood do they use in a month?

9. A village has 20 houses. A scientist has estimated that the trees in the surroundings make up 10,000 kg of wood. If a household uses 10 kg of wood every week, how long does it take the village to exhaust its supply of wood?
10. A man who burns trees for charcoal uses tree trunks, while another, who builds cattle kraal, uses only branches. Which of the two is more destructive to trees? Why?
11. As you travelled through one of the areas where you carried out your interview, imagine you saw the following scene: Tall acacia trees with heaps of their branches at their feet, bare ground with exposed soil, and a dozen extremely thin cows lying under the shade of one of the trees. Further on, there are skeletons of dead animals and near the watering point vultures are feeding on a carcass of a donkey. From the above description write down what you think may have happened.
12. Using your results from the questionnaire write down all the ways you can think of by which man and his livestock contribute to desertification.

Format of the model questionnaire DATE

1. What is the name of your village?
2. To which clan do you belong?
3. How many are you in this household? ☐
4. How many animals do you have?
   - cows ☐
   - camels ☐
   - sheep ☐
   - goats ☐
5. How many of your animals died in the past one year?
   - cows ☐
   - camels ☐

sheep ☐

goats ☐

6. How many of these animals have died of disease and lack of fodder and water?

cows ☐

camels ☐

sheep ☐

goats ☐

7. Do you have livestock in other camps (Fora)?

yes ☐

no ☐

8. When does your livestock leave the homestead for grazing areas?

before sunrise ☐

at sunrise ☐

9. What time of day does your livestock get to the grazing grounds?

morning ☐

noon ☐

afternoon proper ☐

10. Do you have any problems in getting water?

sometimes ☐

yes ☐

no ☐

11. How far is the nearest watering point to your home?

a full day's journey ☐

half a day's journey ☐

less than half a day's journery ☐

12. Do you have enough grass in the surroundings of the watering point?

yes ☐

no ☐

13. (a) How many measures (cups, bottles, milk-containers) of milik does each of your milk cows produce per day?

(b) How many measures of milk (cups, bottles, milk-containers) does each of your milk camels produce per day?

14. Do you sell some of your milk?

yes ☐

no ☐

sometimes ☐

15. Do you use the money you get from selling milk for buying other foodstuff?

yes ☐

no ☐

sometimes ☐

16. How many animals did you sell last year?

cows ☐

camels ☐

sheep ☐

goats ☐

17. Where did you sell your animals?

to the traders who came to the village ☐

at the market ☐

at the government auction ☐

18. How long does it take you to fetch firewood?

a whole day ☐

half a day ☐

less than half a day ☐

19. How many times in a week do you go out to get firewood? ☐

20. For how many days does "a wood-load" last? ☐

21. Do you buy firewood? yes ☐ no ☐ sometimes ☐

22. How many times in a week do you buy firewood? ☐

23. For how much money do you buy firewood?

24. Do you make charcoal? yes ☐ no ☐ sometimes ☐

25. Which trees do you burn most for charcoal?
(give local names) ....
....

26. What parts of the trees do you use for charcoal?

branches ☐

trunks ☐

roots ☐

27. What trees do you use for building up kraals?
(give local names) ....
....

28. What parts of the trees do you use for building kraals?

branches ☐

trunks ☐

29. What kinds of trees and grasses do you use to build your hut?
(give local names) ....
....

30. Where do you get these trees and grasses?

from the surroundings ☐

from a far place ☐

buy them ☐

31. After how many years do you rebuild your huts?

32. Do you cut trees for your animals when grass is scarce?

yes ☐

no ☐

sometimes ☐

33. Which parts of the trees do you cut?

branches ☐

the whole tree ☐

34. How many such trees are required by a herd of goats and sheep of about 70 per day? ☐

35. Which trees are preferred by goats and sheep?
(give local names) ....
....

Household number	1	2	3	4				5				6				7		8			9			10			11		
	Village	Clan	Household members	No. of animals				No. of animals that died				No. of animals died of diseases				Livestock out in camp		Grazing start			Journey end			Water problems			Watering point		
				cows	camels	sheep	goats	cows	camels	sheep	goats	cows	camels	sheep	goats	yes	no	before sunrise	sunrise	after sunrise	morning	noon	afternoon	yes	no	sometimes	a day	½ a day	less than ½ a day

Household number	12		13		14			15			16				17			18			19	20	21		22	23
	Enough grass		Milk production in measures		Selling milk			Selling milk to buy food			Selling number				Animals where			Time spent					Buying firewood			
	yes	no	cows	camels	yes	no	sometimes	yes	no	sometimes	cows	camels	sheep	goats	traders	market	auction	a day	½ a day	½ a day	how many times	"wood load" for...	yes	sometimes	no. of times/week	price/load

Household number	24			25		26			27	28		29	30			31	32			33		34	35
	Making charcoal								Building kraals			Building huts					Trees for fodder						
	yes	no	sometimes	trees used	branches	trunks	roots		trees used	branches	trunks	trees and grasses used	from the surroundings	from far	buy them	how often the hut rebuilt	yes	no	sometimes	branches	whole trees	trees needed by 70 goats	trees preferred

C. *Role-playing: How can desert creep be stopped?*

Target groups: Classes Primary VI - VI, aged 10 - 14 years.
Teaching materials: Cards bearing the roles on them.
Introduction

Role-playing is one of the most popular methods of teaching. It appeals to children from pre-school age till the advanced stage of secondary school. In some pastoral environments in northern Kenya children play a "cow game", where small stones represent cows, small sticks a kraal and longer sticks the herdsboys. Even among grown-ups, role-exchange is one of the group dynamics games, which helps to remove obstacles of free communication among individuals. Some of the advantages of role-playing are:

1. to enhance the development of the child's creativity;
2. to help the child interpret and experience situations quite new to him;
3. to teach the child to preserve and be proud of his identity by identifying himself with his family or clan and to recognize the rational background of his traditional customs;
4. to teach the child to solve problems by means of isolating a limited situation with a limited number of variables which are relevant to his role;
5. to teach the child to be dynamic in his thinking and feeling, especially if roles are exchanged.

Objectives: In addition to the aims stated above this role-playing helps:

1. to encourage pupils to express their views freely;
2. to develop the ability to change one's views with the change of situations and roles;
3. to develop the pupil to be a better citizen through experiencing the role of a government official;
4. to increase the pupils' awareness of the vulnerability of the arid environment and of the causes and consequences of desert creep.

Direct objectives

1. To be able to dramatize or play-read the provided text after the end of the role-playing.
2. Using the information won from role-playing and the play-reading, the pupils should be able to answer the following questions:

   What are the causes of desertification?

   How can desertification be stopped?

Procedure

1. In the case of a total lack of awareness on the part of the learners of the problem of desert creep the teacher should introduce the problem without going into details.
2. To make the role-playing more thrilling, children can pick a card out of a pack of cards with a role written on each. Then they are left to think of the roles, for some days perhaps with their families at home, before the role-playing begins.
3. Most of the roles will be those of the pastoralists of the settlement (Pastoralist I, Pastoralist II and so on). Other roles are those of a delegation coming to visit the village to discuss with the people which measures to take to stop desertification in their area. The roles suggested are:
   (a) the District Officer, who is responsible for the administration of the area and represents the Government;
   (b) a Member of Parliament, who represents the pastoralists of the area and those of neighbouring areas;
   (c) the Range Officer, who is responsible for monitoring pasture lands and recommending ways of using them;
   (d) the Veterinary Officer, who is responsible for treating and vaccinating animals;
   (e) the Forest Officer, who is responsible for afforestation and conservation activities;
   (f) the Water Officer, who is responsible for supplying man and animals with drinking water;
   (g) the Medical Officer, who is responsible for taking care of the people's health;

(h) the Marketing Officer, who organizes the sale of animals and cereals;

(i) the expert on desertification (e.g., IPAL scientist), who can advise people on the problem of desertification and the appropriate measures to combat it.

4. The sitting-order of the class should allow most of the participants to face each other so as to communicate easily. The teacher should not intervene during the role-playing, otherwise he may disturb the interaction within the class.

5. In the appendix a dramatization of a role-playing is given to be completed by the pupils. After they have done their role-playing, they will be able to complete the play. The teacher should correct the linguistic mistakes before the class practises the play-reading.

Appendix: Session on "How can desert creep be stopped?"

A discussion between pastoralists and Government delegation, for play-reading in class.

Scene:

Pupils sit in the class in two groups facing each other. One group represents the pastoralists and the other group represents the Government delegation, which consists of District Officer, Member of Parliament, Range Officer, Veterinary Officer, Forest Officer, Water Officer, Medical Officer, Marketing Officer and an expert on desertification. The members of the delegation have files, through which they look every now and then. The District Officer takes the chair.

District officer:

Dear Citizens, in the name of the District Commissioner and on behalf of the members of this delegation (pointing at each), the Member of Parliament, the Range Officer, the Veterinary Officer, the Forest Officer, the Water Officer, the Medical Officer and the expert on desertification, I should like to greet you all and open our meeting to discuss the serious problem of desertification in your area.

Pastoralist I:

Excuse me, Mister, I have never heard this word "desertation", or what you call it, before!

District officer:

Then, let us call it desert creep. I suppose you are the oldest man here, isn't it so?

Pastoralist I:

Yes, Sir, I think so, I was born before the First World War, but they estimated my age to be 44 at the Registration Office, Sir.

District officer:

Can you remember what this place looked like in the past?

Pastoralist I:

Yes, your Honour, I do remember it very well. It was like paradise on earth, with many shady trees and juicy pastures!

Pastoralist II:

I remember, when I was a boy, we used to hunt a lot of animals!

Pastoralist III:

I saw a lot of elephants in those days!

District officer:

What made the elephants disappear?

Pastoralist III:

When the trees disappeared the animals never came back, your Honour.

District officer:

What had happened to the trees and the grasses then?

Pastoralist I:

The trees had been cleared by the cultivators, Sir.

Pastoralist IV:

Don't blame the farmers alone, Lekupes. We pastoralists, too, have always cut a large number of trees to build kraals for our cattle.

Pastoralist V:

Everybody cuts trees to use for firewood, Sir.

Pastoralist VI:

Don't forget the fires, too, which devour many young trees and burn large patches of grassland every year.

District officer:

So, that's how you have changed your former paradise into a barren desert!

Pastoralist VII:

Not so, your Honour. Are we to blame that God has sent us very little rain for many years now. In the past, it used to rain much more than it does today.

Pastoralist VIII:

Yes, Sir, he is right. We used to swim in a lake in the valley, which disappeared completely. Our young children play football in it now, Sir.

District Officer:

Gentlemen, there is no doubt that the ability of plants to renew themselves has suffered a great deal in the last period of drought. But are we going to blame Nature for the trees we excessively cut, the savannah-fires we set and the large number of animals we are keeping on the poor pastures? Would the Forest Officer like to add something to this?

Forest officer:

As you very well know, trees are very useful to us in many ways. If we cut them quicker than younger trees can grow, very soon we shall have no trees at all. Planting new forests ...

Pastoralist IX:

(interrupting) How do you expect us to build our huts and kraals and to cook our food and make our tea if we do not cut trees?

Forest Officer:

We have actually thought of taking some measures, but we need your cooperation. It is for your own good, and if you do not cooperate, you will be the losers in the end.

Pastoralist X:

What do you want us to do? Do you want us to stop using wood at all and leave our animals unprotected to be killed by the hyenas and lions?

Forest officer:

We are going to suggest the following measures to you:

1. introduce a way of building kraals, which saves half the amount of wood used;
2. introduce a mud-built oven which saves three-quarters of the wood you use in your open-fires;
3. provide you with tree-seedlings, so that each of you who cuts a tree should be able to plant a new one easily;
4. advise you to conserve the area between the valley and the hill for ten years and then use it for grazing purposes for a limited number of animals.

Range Officer:

This is an important point. You have to limit the number of animals grazing in your area if you want to allow the grass to grow again with every rain. Desert creep happens as a result of overgrazing. Overgrazing is caused by keeping far too many animals, more than the land can support.

Pastoralist XI:

(whispering to his neighbour) What does this man mean by too many animals?

Range officer:

(turning to Pastoralist XI) Do you have a question?

SECONDARY SCHOOLS

Recommendations for teaching the subject of "The problem of desertification in Kenya and in the Sahelian Zone".

I. Didactical relevance

1. Problem-orientated education finds in the complex problem of desertification a theme of high current interest, in which matters of land ecology, biology, climate, hydrology, economy, sociology and politics are closely interwoven. Interdisciplinary education can thus be practised within this subject.

2. Desertification is a world-wide problem of such high relevance that the UNO organized a world conference in Nairobi in 1977 on this question. The UNO General Assembly passed the "Plan of Action to Combat Desertification", which aspires to solve the problem by the year 2000. This aspiration, however, seems to be far from being achieved, for the problem of desertification is already a major problem of the countries of the Third World.

3. The danger of desertification is highly alarming. The deserts of the world expand several thousand square kilometres annually. The Sahara alone has encroached upon an estimated belt of 650,000 square kilometres at the northern margin of the Sahelian zone in the last 50 years. That is an area larger than Kenya (Kenya: 583,000 km^2) and three times as large as Great Britain. In fact, one-third of the surface of the earth is either desert or exposed to desertification. To this part of the world belongs 75% of the surface of Kenya.

4. The theme of the degradation of dry lands fits in very well with a considerable number of subjects included in the syllabuses of biology and geography. The objectives are akin to those mentioned in the programmes of the Primary Schools. These objectives are reflected in the regulations and syllabuses required for the Kenya Certificate of Education (KCE) and the Kenya Advanced Certificate of Education (KACE) which are reviewed below.

particular topic through fieldwork, e.g., land use, river valley, etc." Here is a good opportunity to present IPAL as a case study suitable for fieldwork.

7. In the KACE syllabus of biology, page 124, there is a section on "Man and his environment : The effect of population changes. Use and conservation of natural resources, e.g., soil, water, plant and animal farming, foresty and fisheries". There is also an "ecology project" to which 30 periods are dedicated. Compared with what is foreseen in the syllabus for sciences in the primary phase, however, the portion of environmental education in the syllabus of biology in the secondary schools is much less. But within the ecology project of 30 periods, a case study on desertification, e.g., in the IPAL area, can be conducted.

8. In the KCE Syllabus of biology, page 146, there is only little space given for the study of "Man and Natural Resources Importance of air, land, forests, wildlife and their conservation" (c.f. the part on SSP Biology).

In the KCE syllabus of agriculture, there are several parts which relate directly to the education of (arid) land management such as:

Principles of land use:

Various forms of land use: agriculture, foresry, wildlife conservation with respect to physical, economic and social factors, commercialization, communication and marketing. Crop and live-stock distribution in relation to ecological zones.
Important local systems including shifting cultivation and nomadic herding.
Rates of population increase, population density and pressure on land.

Climate

Soil and water conservation: soil erosion causes and effects. Basic importance of conservation to soil fertility.
Principles of cultivation.
Grass and management.
General management of livestock.
Animal products.

9. This review of the KCE and KACE "Regulations and Syllabuses" reveals that the Kenyan Ministry of Education is fully aware of the importance of environmental education so as "to prepare the pupil for service to his country. IPAL, therefore, need not exert any effort to convince the Ministry of Education of the value of environmental education. Only the portion dedicated to arid and semi-arid environments should be ensured. What is needed is actual implementation. IPAL, however, because of its personnel and financial constraints cannot indulge in teaching practices on a wide scale. But it can do the following:

(a) Supply teachers with scientifically valid information on the problems of arid and semi-arid environments. This information should be presented in a form suitable for use by secondary school students and teachers of the higher classes.

(b) Give illustrations of how environmental education can be conducted by providing teachers with learning units.

(c) Develop audio-visual aids for educational and training purposes.

II. Review of geography and biology books used in Kenyan secondary schools - their suitability for environmental education

A. *Biology*

SSP Biology, years 1 and 2, Science Section, Kenya Institute of Education, Jomo Kenyatta Foundation, Nairobi 1978.

Chapter 2, "Living Together", introduces the pupil to ecology

Chapter 7, "Soil and Plant Nutrition", provides the pupil with basic knowledge about the formation of soils and ways of examining them. Soil fertility is also analysed. Soil deterioration is dealt with, loss of minerals from the soil, leaching and soil erosion. The effect of slope and plant cover on soil includes the following subjects: Bush-fallow rotation farming, overgrazing, crop rotation, mixed cropping, mulching, contour farming, terracing and strip cropping.

Chapter 8, "The importance of green plants",is ideal for giving pupils basic information on range management. It highlights the following subjects:
What do farm animals eat?
The growth rate of grasses.
Carrying capacity.
Carrying capacity of East African grasslands.
Pasture improvement.
Measurement of biomass.
Ratios of food eaten to weight gained.

SSP Biology, Year 4, Kenya Institute of Education, Jomo Kenyatta Foundation, Nairobi 1977.

Chapter 7 deals with "Man and his natural resources" and introduces the concept of "Ecosystems". Man's negative impact is pointed out: "... he often misuses his natural resources. Large areas of land are constantly being ruined due to soil erosion, which is a result of poor methods of cultivation, deforestation and overgrazing ... if man is to continue to survive he must understand his environment and use his natural resources wisely, not only for himself but also for future generations."

D. G. Mackean: Introduction to Biology, Year 3.
New tropical edition. Includes a chapter on soil (pages 78-81), which can be used in connection with learning units on soil degradation.

R. Soper and S. Tyrell Smith: Biology, An Integrated Approach, Year 2-4 for Tropical Schools includes relevant material in: "Soil and Agriculture", pages 233-56 and "Ecology", pages 257-73.

B. *Geography*

G.M. Hickman et al.: The Lands and Peoples of East Africa, Longman 1973, 1980.

Chapter 3, "Soils and their Use", treats soil erosion as a result of overcropping and overgrazing and points out ways of controlling erosion.

Chapter 8, "The dry plateaus", deals with land use in arid and semi-arid plateaus in East Africa. Development schemes are tackled,

but little is said about the hazards of overuse of dry lands of limited resources. Here is a chance to deal both with overgrazing and overcultivation and the problems resulting from them.

R.C. White: Africa, Nairobi 1973, 1981.

Chapter 1 is "The adaptation of farming to the environment in northern Zambia". Here the deterioration of the savannah through misuse is dealt with. Some major problems are tackled:
The problem of rainfall variability (unreliability).
The problem of soil erosion (deterioration).
Arguments for and against burning the soil.
Problems of changing traditional farming systems in Africa.

Chapter 3, "Trees are the friends of man". These words were said by Jomo Kenyatta on the national tree-planting day on which an estimated 500,000 trees were planted by Kenyans at their homes and farms. In his speech Kenyatta warned against the haphazard and indiscriminate cutting down of trees. Though only humid woodlands are dealt with in this chapter, the discussion on the use of timber and firewood and the need for economy in wood consumption and wood supply, also in arid and semi-arid regions, should be pursued.

Chapter 7, "Cattle Keeping: From pastoralism to ranching in Nigeria and Botswana". The Fulani pastoralists are taken as an example here. The subject of transhumance as a form of economy and way of living which is entirely adapted to environmental conditions is treated in detail. Also the recent changes in traditional pastoralism and the resulting problems are discussed. A second example is that of cattle keeping in Botswana. The disastrous effects of drought are displayed by a picture of a dead cow entitled "How could this sad scene be avoided?" Suggestions are made under the titles:
"Demonstration ranches help create an improved cattle industry", "Extension work", "Marketing", and "The development of farming in Africa".

Chapter 8, "The forgotten Highlands". Taking the examples of Lesotho and Ethiopia the problems of soil erosion in highlands is dealt with.

Chapter 10, "The Deserts: Is any development possible?" Here extreme deserts are treated. Desertification problems are limited to those of oases.

The fore-going subjects are all suitable for introducing the degradation problems in arid and semi-arid lands. What is needed is to make the teacher more aware of the urgency of these problems and their relevance to environmental education. Some audio-visual material should be available to support the teacher's work, for awareness alone, without providing the means of implementation, is fruitless.

III. Objectives

Pupils should:

1. perceive that man destroys his own livehood by land use practices which are not adapted to the natural resources;
2. realize that man can protect and rehabilitate his nutrition basisby following rational methods of land use;
3. perceive that we all will, sooner or later, be affected by the impact of man on the ecosystems of other zones of the earth;
4. be willing and prepared to help other peoples or clans to adopt land use methods which are more adapted to their environment;
5. realize that nature sets limits for man's use of dry lands and that ignoring these limits has serious consequences;
6. realize that the natural ecosystem (climate, vegetation, soil, water balance, animals) in the arid zone has a delicate balance, which can easily be upset by the impact of man;
7. be able to assess the roles played by man and nature in the process of desertification;
8. be able to interpret aerial photos, maps and diagrams;
9. be able to deal with statistics;
10. be able to do fieldwork and run experiments, developing the talents of observation, recognizing, analysing, synthesizing and summing up results.

IV. Methodological approaches

The method of teaching will differ according to the standard of the learners, their age, their environments and the facilities and audio-visual aids available. It would be most commendable if close cooperation between the subjects of biology and geography could be achieved in planning and carrying out environmental education. The suggested methods could be conducted on an interdisciplinary basis or could be limited to either biology or geography with some emphasis on aspects relevant to either subject. They can also be used for the subject of agriculture. Examples are given below:

A. *Desertification, a world-wide problem*

1. Preconditions, causes and consequences of the ecological degradation of arid and semi-arid zones.

(a) Objectives

Pupils should:

realize that desertification is a world-wide problem;

learn to differentiate between preconditions, causes, phenomena, indicators and consequences of desert formation;

perceive that rainfall fluctuation and recurrence of droughts favour desert formation;

realize that man plays the most active role in triggering off the process of desertification;

know which zones and which countries are affected by desertification;

know the indicators of desertification;

grasp the ecological differences between desert, steppes, thorn-scrub savannah, dry woodland savannah and humid woodland savannah;

learn to interpret maps, pictures and climate diagrams.

(b) Materials

World Map of Desertification 1 : 25 million A/Conf. 74/2, UNDP, Nairobi 1977;

climate diagrams and pictures of the zones affected by desertification;

long-term diagram of rainfall variability of one or several gauges in different areas of the arid and semi-arid zones;

a diagram showing the vegetational zones affected.

(c) Procedure

Using the World Map of Desertification the pupils should learn to interpret the following factors:

(i) The climatic preconditions

That aridity is closely related to the problem of desertification is a fact which is universally acknowledged. The World Map of Desertification delineates 4 bioclimatic zones which are relevant to desertification:

The hyperarid zone, where $\frac{\text{Rainfall}}{\text{Evapotranspiration}} = < \frac{3}{100}$.

This zone is practically plantless except for ephemerals and shrubs in river beds. It corresponds to extreme desert and is virtually unsettled.

The arid zone, where $\frac{\text{Rainfall}}{\text{Evapotranspiration}} = \frac{3}{100}$ to $\frac{20}{100}$.

It comprises dry lands with sparse perennial and annual vegetation. Nomadic and semi-nomadic pastoralism can be practised here, but rainfed agriculture is not possible.

The semi-arid zone, where $\frac{\text{Rainfall}}{\text{Evapotranspiration}} = \frac{20}{100}$ to $\frac{50}{100}$.

It includes steppe or tropical shrubland with a discontinous herbaceous layer and increased frequency of perennials. Livestock breeding and rainfed agriculture are both possible in this zone.

The subhumid zone, where $\frac{\text{Rainfall}}{\text{Evapotranspiration}} = \frac{50}{100}$ to $\frac{75}{100}$.

It is characterized by more dense vegetation. It includes tropical savannahs, mediterranean maquis (dense bushland), and steppes with black soils. Rainfed agriculture is common in this zone for crops adapted to seasonal drought.

(ii) Degree of desertification hazards (in zones likely to be affected by desertification)

Very high.

High.

Moderate.

(iii) Vulnerability of land to desertification processes

Surfaces subject to wind erosion.

Stony surfaces subject to sheet erosion.

Alluvial surfaces subject to stripping of topsoil and gully erosion on slopes.

Surface subject to salinization and alkalinization.

(iv) Human and animal pressure

High human pressure (including mechanized farming).

High animal pressure (leading to overgrazing).

2. The bioclimatic zones should be illustrated by showing pictures of the natural landscapes of these zones and a corresponding climatic diagram showing the curves of temperature and precipitation. The learners should be asked to interpret these pictures and diagrams bearing in mind the degree of humidity, which can be grasped by combining the two curves. (Evapotranspiration increases with the rise of temperature.)

3. The pupils can be asked to draw a diagram (or histogram) of rainfall of a certain station, where data are available for a large number of years. They can then draw the line showing the annual mean. (They get the mean by adding the sums of all the years and divide the total by the number of years.) They will then realize how variable rainfall is in arid and semi-arid zones. They will also recognize a recurrence of periods of drought and others of humidity. What has this to do with desertification? It should be pointed out that during humid phases the number of livestock increases rapidly. When the drought phase occurs, a disastrous reduction takes place. Owing to the rapid human population increase in the last decades, accompanied by a loss of mobility owing to the settlement policy of colonial and post-colonial authorities, ecological degradation took place.

4. Pupils could be asked to draw a profile of the vegetational zones of Africa from the Equator northwards or southwards. In so doing, they should take into consideration:
the change of tree species;
the change of tree height and density;
the change of the combination of trees and grass-covers.

(d) Evaluation

There is good opportunity to ask students to interpret maps, diagrams and pictures. They can also be asked to sum up what they know about:

the natural preconditions of desertification;

man's role in causing desertification.

2. The process of desertification

(a) Objectives

The learners should:

realize that the process of desertification is a complex one;

know that the vulnerable ecosystems of arid and semi-arid zones provides the preconditions for the process of desertification;

realize that the ecosystem is the result of an interaction between climate, vegetation, soil, rock, water balance, relief and living organisms and that changing one single factor triggers off a chain of reactions;

realize that man's impact on the delicate ecological balance of arid and semi-arid areas can upset this balance;

know that the ecological consequences of land misuse embrace many factors such as: the loss of the regeneration power of vegetation, soil erosion, dune formation, soil concretion and salinity;

realize that many socio-economic problems result from desertification;

know that drought disasters are not simply due to natural aridity but mainly caused by man's land use practices.

(b) Method

Using the desertification scheme provided here the teacher can discuss with the learners the question of ecological balance, the different forms of man's impact, the ecological consequences of this impact and the subsequent socio-economic problems.

If the foregoing lesson on "Desertification, a world-wide problem" has been exhaustive, the learners may try systematically to construct this kind of scheme on the blackboard. The teacher may give the suggested scheme at the end, if the one they developed is incomplete.

To make this theoretical approach more lively the teacher should use pictures and diagrams to illustrate the conditions described.

(c) Evaluation

Learners could write a brief account of the process of desertification, its preconditions, causes and ecological and human indicators.

3. Overgrazing

(a) Objectives

The learner should:

realize that nomadic animal husbandry is the form of extensive land use which is most adapted to dry lands;

realize that herdsmen and cultivators compete with each other and complement each other on the land they commonly use;

know that overgrazing damage caused by the herds of settled cultivators is greater than that caused by nomadic herds;

realize that cultivators are partly responsible for the overgrazing caused by the herds of nomads because the former have pushed the latter into marginal areas by using the best pastures for cultivation;

learn how to calculate the carrying capacity and rates of overstocking;

work out suggestions for overcoming the problem of overgrazing.

(b) Procedure

Using the following IPAL Techinical Reports: Ela, Elb, E2 and E3: "Impact of human activities of land use practices on grazing lands", the problems of overstocking can be tackled. Solutions are to be worked out by the pupils. A diagram showing the rapid increase of animal population in Kenya should be made. The rivalry between nomadic pastoralists and sedentary cultivators should be illustrated by an example from outside the IPAL area, e.g. Masai land, or an area in the Sahelian zone.

(c) Evaluation

(i) Learners can calculate the overstocking rate in a certain area from the following data:

number of different kinds of animals grazing in that area;

the equivalent of each kind in T.L.U. (Tropical Livestock Units);

the surface of the area in km^2;

the carrying capacity of the area in T.L.U. / km^2.

(ii) Learners could hold a debate on the motion "Should nomads be settled". The pros and cons could then be summarized by each student.

4. Overcultivation

(a) Objectives

The learners should
realize that cultivation combined with sedentary animal breeding in dry lands is a major cause of desertification;
know that subsistence cultivators are not able to take decisive measures on their own to protect their land against the damage of soil erosion and that they need to be helped;
be able to interpret photos.

(b) Procedure

An example of a certain area of the semi-arid zone under excessive cultivation should be chosen for illustration. Photographs of soil erosion there could be interpreted, and the reasons for and the process of soil erosion could be explained. Tables showing the decrease of crop yields per acre could be correlated with annual precipitation figures and then interpreted. The question of the so-called "agronomic dry limit" can be discussed by raising the following points:
Which are the controlling factors of rainfed cultivation?
Where does the climatically adapted agronomic dry limit lie?
Where does the actual limit of rain-cultivation in East Africa (or in the Sahel) lie?
Why has cultivation spread beyond the climatically adapted agronomic dry limit?

(c) Evaluation

Learners can investigate in which parts of their country (e.g., Kenya) rain-fed cultivation has spread beyond the climatically adapted agronomic dry limit and which parts can still be taken under cultivation without causing soil deterioration. The students will have to define the criteria of such land classification and collect data on the marginal areas concerned.

5. Desertification as a result of destroying the natural tree-stock

(a) Objectives

The learners should:

know that the inhabitants of arid and semi-arid areas use immense amounts of wood daily for heating and building purposes;

know that these people have no other alternative;

realize that this "Strip-mining" way of using wood resources will have serious consequences for the affected zone;

realize that immediate measures have to be taken to solve the problem;

perceive that the affected people should be helped, but, at the same time, no solution can be achieved without their active cooperation.

(b) Procedure

Using IPAL Technical Reports which deal with woodland ecology, afforestation and wood consumption, students can study a real case.

The study should include:

Primary wood production;

The uses of the different woody species;

Wood requirements for fuel and building huts, enclosures and kraals;

How to improve wood production;

How to decrease wood consumption;

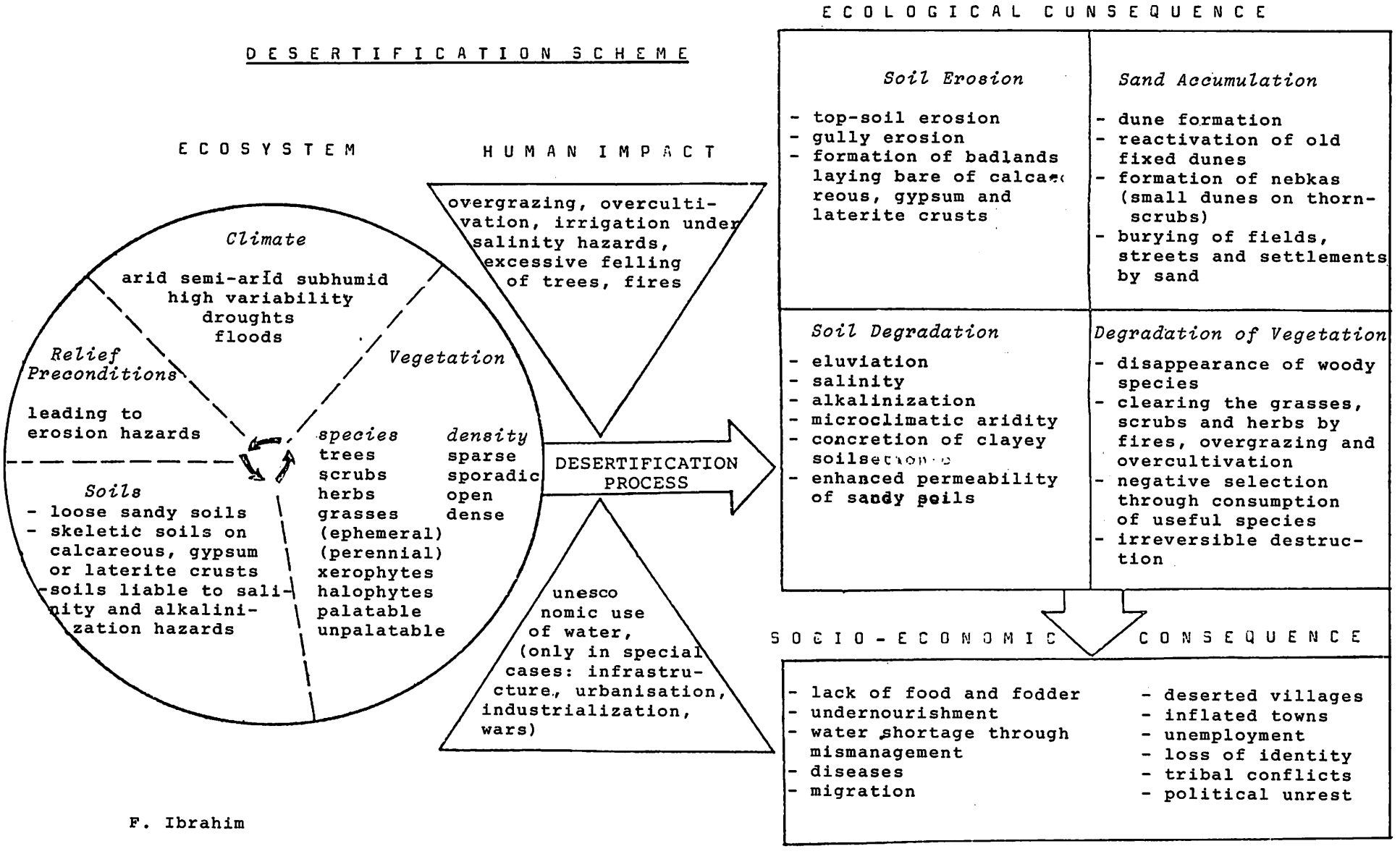
Possibility of wood transport from other zones and of wood-marketing.

Students could calculate firewood requirements of a people (e.g., Kenyans) supposing that 14 million Kenyan depend on firewood for fuel, that each household requires the wood of a small tree per week and that the average number of a Kenyan household is six persons. How many trees would be cut in one year, in ten years?

(c) Evaluation

Students may answer the question:
"What measures should be taken to stop the destruction of woodland and yet secure the supply of fuel and building material?"

If more time is available one can add to the learning unit of "Desertification, a world-wide problem" the subject of salinity, water-logging and alkalinization in arid areas under excessive irrigation (such as in Egypt and Pakistan). A final lesson could be devoted to summing up proposals for measures to combat desertification. The teacher is referred to the "Plan of Action to Combat Desertification", UNDP, Nairobi 1977.


DESERTIFICATION SCHEME
ECOSYSTEM
HUMAN IMPACT
ECOLOGICAL CONSEQUENCE
Climate
arid semi-arid subhumid
high variability
droughts
floods
Relief Preconditions
leading to
erosion hazards
Vegetation
species
trees
scrubs
herbs
grasses
(ephemeral)
(perennial)
xerophytes
halophytes
palatable
unpalatable
density
sparse
sporadic
open
dense
Soils
- loose sandy soils
- skeletic soils on calcareous, gypsum or laterite crusts
- soils liable to salinity and alkalinization hazards
overgrazing, overcultivation, irrigation under salinity hazards, excessive felling of trees, fires
DESERTIFICATION PROCESS
unesco
nomic use
of water,
(only in special
cases: infrastructure, urbanisation, industrialization, wars)
Soil Erosion
- top-soil erosion
- gully erosion
- formation of badlands laying bare of calcareous, gypsum and laterite crusts
Sand Accumulation
- dune formation
- reactivation of old fixed dunes
- formation of nebkas (small dunes on thorn-scrubs)
- burying of fields, streets and settlements by sand
Soil Degradation
- eluviation
- salinity
- alkalinization
- microclimatic aridity
- concretion of clayey soils
- enhanced permeability of sandy soils
Degradation of Vegetation
- disappearance of woody species
- clearing the grasses, scrubs and herbs by fires, overgrazing and overcultivation
- negative selection through consumption of useful species
- irreversible destruction
SOCIO-ECONOMIC CONSEQUENCE
- lack of food and fodder
- undernourishment
- water shortage through mismanagement
- diseases
- migration
- deserted villages
- inflated towns
- unemployment
- loss of identity
- tribal conflicts
- political unrest

F. Ibrahim

B. *Questionnaire: causes of Desertification*

The questionnaire used under Chapter I, IIIB which is for the advanced primary stage, can also be used for the secondary stage. All the questions can be easily used. But the evaluation should be more advanced by getting more results from the data collected. The following questions should be added to the first 35 questions if the questionnaire is conducted in an area where rain-fed cultivation occurs:

36. How many acres (or other measuring unit) has your family cultivated this year? and what yields did you bring in?

    crop ☐ area ☐ yield ☐

37. How many acres (or other measuring unit) did your family cultivate last year? and what yields did you bring in?

    crop ☐ area ☐ yield ☐

38. How much corn (mention kind of cereal) does your household consume per year?

    .....

39. Do you employ agricultural labourers to work for you? How much do you pay them per year?

    .....

    .....

40. Do you practise a cultivation - fallow rotation? How long is each period?

    .....

    .....

41. Do you practise a crop rotation? Describe.

    .....

    .....

    .....

42. How many acres do the following men in your village have?

    the richest man ☐

    the poorest man ☐

    yourself ☐

43. What is the source of your living?

mainly cultivation ☐

mainly livestock ☐

equally cultivation and livestock ☐

mainly another occupation (trade, employment, etc.) ☐

C. *Experimental study: The carrying capacity of grasslands*
(for Form 1 and 2)

(a) Objectives

Pupils should:
be able to relate the amount of grass consumed by a rabbit to the productivity of a certain plot of grass;
be able to calculate the carrying capacity of an arid area (e.g., IPAL area) by interpreting the given data on the area, livestock numbers and animal consumption;
know the damages caused by overstocking;
be able to work out suggestions for overcoming overstocking;
acquire the following knowledge;
that the carrying of a certain area is expressed by the number of animals that area can support;
that carrying capacity depends on primary productivity;
that primary productivity depends on the amount of rainfall, surface and ground water and soil quality.
that a certain area would have different carrying capacities for different kinds of animals.

(b) Procedure

(i) An experiment on the carrying capacity of a grass plot using a rabbit can be carried out by the pupils. In the course of the experiment, the pupils will be confronted with a number of problems to solve if they want to attain a proper estimation of the carrying capacity of a natural pasture.

(ii) A plot of grass is used to provide fodder for an average rabbit. The grass should be closely cut or mowed. Only the amount of grass consumed by the rabbit should be cut daily so as to avoid waste. This amount is to be weighed. No plot should be mowed twice. The experiment is to be carried out till the grass of the plot mowed on the first day has grown to its normal height again. The total area mowed for the experiment should be measured. The experiment is concluded.

Household number	36						37						38	39		40			41				42			
	Crop						Crop						Labour wages	Years of rotation		Years of rotation			Tenure				Source			
	area	yield	area	yield	area	yield	area	yield	area	yield	area	yield		cultivation	fallow				richest	poorest	average	yourself	cultivation	livestock	cultivation-livestock	other

(iii) Supposing that the area mowed is 20 m^2 in 18 days producing 5 kg of grass, the following conclusions can be drawn:

Primary productivity per hectare per year =

$$\frac{10000 \times 365 \times 5}{20 \quad 18} = N\ 5000\ kg$$

Carrying capacity

$$\frac{10000}{20} = 50 \text{ rabbits/hectare}$$

(iv) This experiment assumes that the 18 days have a climate typical of the whole year, which is impossible in dry lands. Students should bear this fact in mind and know that this was only done for the purpose of demonstration.

(v) After this experiment IPAL will be taken as a case study. IPAL Technical Reports provide ample imformation on the physical situation of an area of 23,000 km^2, its primary productivity, the kinds of livestock grazing there, animal density and concentration areas. If the students have the facilities to make a field-trip to the area, they can use the facilities of IPAL at Marsabit.

(c) Evaluation

The students' reports on the experiment and their interpretation of the IPAL Technical Reports should show that they have learned a lot about carrying capacity. If this is not the case, the teacher should give them a question on calculating the carrying capacity of a certain area.

D. *An investigation into rangeland deterioration*

A suggested A-level ecology investigation by I. Allen.

This course seeks to examine an example of man-induced disturbance in rangeland where some degree of deterioration has taken place (i.e., overgrazing), and to compare this with a less disturbed situation in the same locality. The emphasis is on determination of rangeland condition by comparison of ecological data from two stands.

Target population: Form V students.

(a) Objectives

1. To draw attention to the necessity of being able to study a stretch of rangeland quantitatively.

2. To give an indication of the relevance of ecological knowledge to rangeland management.
3. To introduce students to some of the methods of obtaining ecological data.

(b) Plan of course

Introduction:	Why Ecology? The rangeland 1-1 type ecosystem. Aspects of rangelands one can measure. Random sampling. (1 double period).
Field trip 1:	Investigation of soil crust. Water infiltration. Observations of erosion. Soil profiles. (half day)
Lecture: Soil:	Soil capping. Colloidal properties of soil. What makes soil acid? Soil organisms. (1 double period)
Laboratory practical: soil analysis:	Determination of soil pH. Determination of colloidal content of soil samples. Estimation of percentage of organic matter. Estimation of soil organism activity by CO_2 production. (2 double periods)
Field trip II:	Quadrat sampling: Investigation of biomass, litter, moribund tissue, species diversity and plant age structure. (half day)
Laboratory practical: vegetation analysis:	Calculation of species diversity, etc. (1 double period)
Field trip III:	Basal cover estimate. (half day)
Lesson:	Summary of rangeland assessments. (1 double period)
Lecture:	Vegetation and grazing systems. (1 double period)
Laboratory practical:	Setting up cropping experiments. (1 double period)

(c) Material required

1. Workbook

Each student should be provided with a workbook containing specific instructions for carrying out each experiment and each field trip. In addition, the workbook should contain a table of random numbers, plus field work sheets.

2. Basic laboratory equipment for laboratory practicals.

3. Basic field study equipment, including 10 point frame for basal cover estimates, and metal rings for water infiltration experiment. Quadrat rods (each 50 cm long), pruners (or sturdy scissors), paper bags, felt pens for labelling, and labels with strings for plant labelling are also required for vegetation sampling.

Field work sheet: *Investigation of range deterioration*

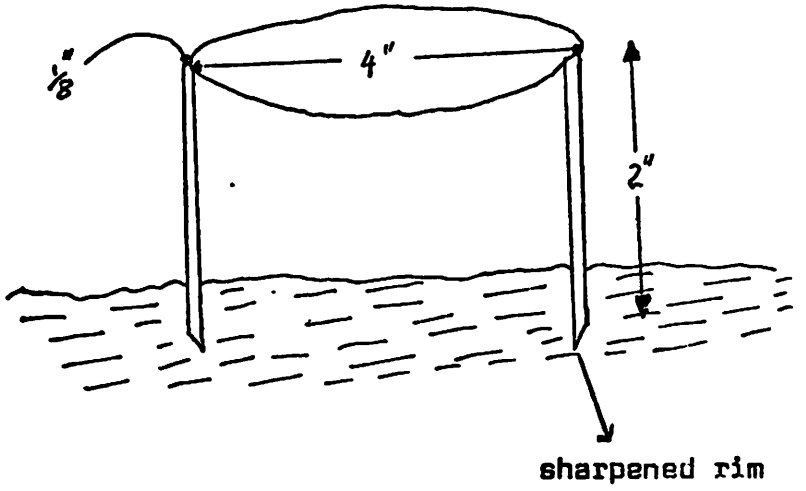
Water infiltration: Investigation of soil crust

The time which a set amount of water takes to penetrate the soil gives an idea of the permeability of the soil and the degree of capping or crust formation.

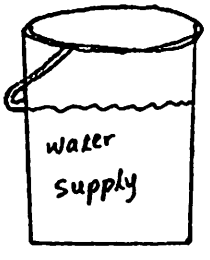
A minimum of one exercise on each of the two stands is required. Sample points are selected by using random number tables.

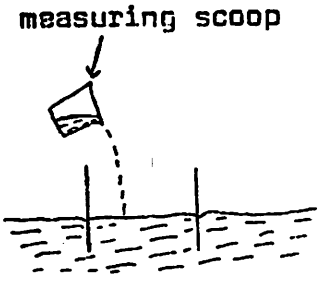
Procedure

A 10 cm diameter metal cylinder with one rim sharpened is gently tapped with a hammer into the soil until the sharpened edge is firmly wedged, with minimum disturbance to the soil.



Using a 200 ml or 100 ml cup, scoop up set amounts of water and pour this into the metal pipe.





Measure the time it takes for the water to sink into the soil. Stop timing when the soil haa a glistening appearance. Repeat the pouring and timing procedure without moving the metal cylinder until the soil is saturated or, alternatively until at least six units of water have been poured over the soil. As a graph is to be constructed a good number of recording are required.

Record of results

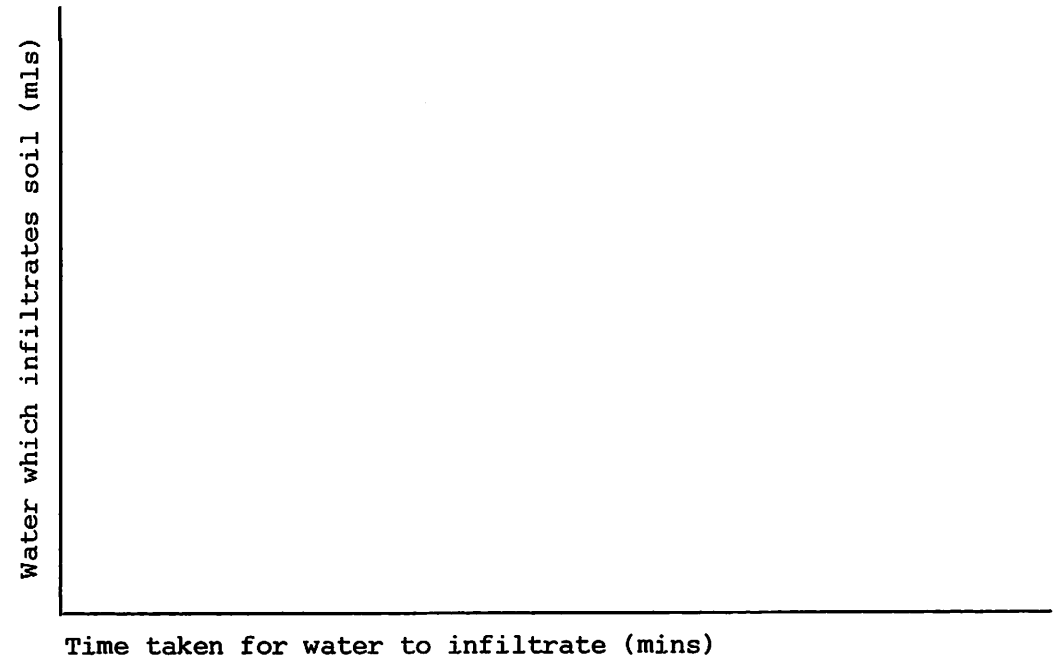
Sample in stand X

Amount of water poured (mls)		Time taken per unit of water (mins)	Total time taken (mins)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Sample in stand Y

Amount of water poured (mls)		Time taken per unit of water (mins)	Total time taken (mins)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Rough graph of results



Construct two rough graphs for X and Y. This will provide some immediate idea of the nature of the soil crust and indicate when this has been penetrated. The nature of subsoil layers may also be indicated.

Equipment required per pupil unit:

1 bucket
1 large container with water which will not spill during transport (e.g., Alginate swimming pool container)
1 stop watch or watch (second hand desirable)
1 measuring scoop (100 ml or 200 ml depending on permeability of the soil crust)
1 metal cylinder (internal diameter 10 cm, height 5 cm)
1 hammer

TERTIARY LEVEL

I. Introduction

IPAL base at Marsabit should be turned into an "Institute of Arid Lands Research", which would continue its activities after the termination of the present phase in 1983. The justifications for establishing such an institute are:

1. Despite the fact that there are a number of Kenyan institutes engaged in environmental studies and agricultural and range development, there is no institution which is concerned with arid lands research. Bearing in mind that the greater part of Kenyan territory belongs to the arid climatic regime, establishing such an institute must have a high priority. The planning and implementation infrastructure exist within governments. What they often lack, and what is often expensive to implement, is research to get the basic information for the planning and implementation of development projects. This role could be fulfilled by such an institute.
2. IPAL has produced a considerable amount of good research results in that last 5 years and it would be a great pity if this knowledge was not passed on to Kenyan and other African scholars.
3. IPAL has established a good infrastructure for research work in northern Kenya which would make it easy for scientists to operate smoothly in otherwise inaccessible desert and semi-desert areas.
4. Establishing such an institute in Marsabit would meet the great need to decentralize research and training institutions and promote provincial development.
5. One of the decisive issues which made the present donor country sponsor IPAL is its important role in research and training.

II. Target groups

Before an institute of arid lands research is established where scholars are both trained and carry out research, seminars have to be organized for different groups. For practical reasons these

seminars should last for one week at Marsabit, including field-training for three days. Relevant target groups are:

1. Extension officers;
2. Teachers;
3. Students;
4. Post-graduates doing research work on arid lands;
5. Scientists and decision makers from Kenya and other African countries.

III. Objectives

For each of the above-mentioned target-groups specific objectives have to be formulated according to the specific type and aims of each group. The general objectives of tertiary training, however, are:

1. To create and strengthen awareness of the serious hazards to which arid and semi-arid environments are subjected.
2. To inform the participants precisely about the process of land degradation, its causes and forms, and its ecological and socio-economic consequences.
3. To enable the participants to differentiate between the climatic causes of desertification and the anthropogenic ones.
4. To teach the participants how to monitor land deterioration by acquiring certain skills, such as those of interpretation of maps, aerial photos and satellite imagery, soil analysis, data collection and interpretation and how to make proper use of the available literature and to contact the relevant institutions for further studies.
5. To enable scholars doing research to make use of the existing facilities and to coach them during their stay in the field.
6. To bring scientists, extension workers, teachers and decion-makers together to exchange their knowledge and experience of arid lands, thus helping them to acquire an integrated approach in solving the problems of the arid zone.
7. To help teachers develop new methods and audio-visual aids for teaching relevant subjects.

IV. Methods

1. Sessions

The sessions should include the following items:

(a) Papers delivered by IPAL scientists and other experts recruited for the seminar on the main subjects:

Physical geographical aspects of arid lands:
climate, water balance, surface and groundwater resources,
relief, soil and geomorphologic processes;
Range ecology;
Livestock management;
Woodland ecology and wood consumption;
Agriculture;
Economy in arid lands;
Human ecology;
Monitoring arid environment;
Environmental education.

These papers should be methodologically adapted to each specific target-group. This requires considerable modification of the scientific findings of IPAL.

(b) Short contribution by the participants each on his work field.

(c) Discussions and recommendations.

(d) Summarizing results.

2. Field-training

This part of the programme should be organized thoroughly to avoid it turning into a tourist style exercise. In addition to visiting relevant sites and getting illustrations of what has been discussed, participants have to carry out tasks, such as surveying a certain area and the people living there or writing down observations on certain aspects of arid land ecology.

3. Audio-visual aids

During the seminar films, slides, maps, photos and posters should be used, not only by way of illustration but also with the intention of making participants use these audio-visual aids in their own teaching or extension work.

V. Evaluation

A suitable way of evaluationg participants is to make them cooperate in writing a report on the seminar they have attended.

ADULT EDUCATION

The problem of desert creep

I. Didactical relevance

1. It has long been believed that unless the inhabitants of the areas affected by desertification are made aware of the causes of land deterioration, no improvement can be achieved, whatever measures are taken by the authorities or development organizations.

2. It is difficult, however, for an ecology expert with no profound knowledge of the affected ethnic group and its traditions to be able to teach these people the "more adapted" methods of land use. For the inhabitants would soon realize that "the expert" does not understand what is most rational to them.

3. For this reason, it is necessary to train teachers who belong to these specific ethnic groups to carry out adult education. Considering this, we shall provide illustrations of methods worked out by a teacher who belongs to the IPAL area limiting himself to that pastoralist environment.

4. Adults differ from children in that they would associate teaching with development measures. Thus, adults would demand immediate action from the teacher, who would not be able to offer any help to alleviate the deteriorating conditions. Frustration would then be the result of this teaching. And as long as no feasible alternatives for the "faulty" land use practices are offered, this kind of education would be rendered futile.

II. Objectives

Adults should:

1. realize that they cannot continue following "strip-mining" methods in using pastures, for they are actually destroying the livelihood of the next generation;
2. realize that it is their duty to protect and improve the resources of their environment;
3. understand that droughts are only partially responsible for the deterioration of pastures and that misuse is also to blame;

4. be willing to carry out measures to increase the lasting productivity of land;
5. realize that they have to depend on themselves in solving the problem of desert creep and that external help is only of limited effectiveness.

III. Methods

1. Radio programmes

Consultant Dr Irma Allen has developed and conducted about 20 radio programmes for the Rendille on the work of IPAL. The Voice of Kenya has broadcast these programmes and Dr Allen has assessed them. She reported on this in detail in her consultancy report. Reference is made to this report for it points out the objectives and procedure of work.

There is no doubt that radio is a very effective means of propagating ideas, for it teaches and entertains at the same time. Only technical difficulties would impair its success.

It is therefore recommended that these radio programmes, which have proved quite successful in the IPAL area, should be continued and be translated into other languages for other pastoralist ethnic groups. Owing to the fact that such programmes require considerable technical knowledge, one should try to make the Voice of Kenya adopt this project and assign to it a permanent team. This team should be sponsored by IPAL, especially in its search for relevant subjects and valid information.

2. Barazas (gatherings)

On pressing motions in arid lands such as: deterioration of pastures, lack of drinking water and why trees should not be excessively cut.

"Baraza" is a Swahili word which means a gathering of people who have come together to discuss a pressing problem and take decisions. It is often used by administrative officials to explain government policy, raising funds or meeting an important person. Representatives from each of the surrounding villages have to attend these Barazas and later report to the people of their respective villages on the discussions made and the decisions taken.

It is recommended that the (IPAL) educationalist should meet the elder presiding at the Baraza in order to explain to him all about the issue of land degradation, or the specific topic of the Baraza. While introducing the meeting the elder would then be able to outline what the meeting is about. He would use some of the information given to him by the educationalist beforehand.

When invited to speak the teacher would explain the whole issue using a language comprehensible to the pastoralists. It is important that he should use the language of the respective tribe. If available, visual-aids, such as posters and films should be used. Reference is made to the poster designed for primary education.

Discussion must be a major part in this Baraza so that the educationalist should know the actual possibilities and constraints in pastoralist societies. Feasible decisions should be taken. The next Baraza should function as a follow-up.

3. Giving talks supported by the projection of slides or posters.

For this purpose IPAL should select a series of slides or produce a series of posters showing the different aspects of pastoral environment and its problems. There is already a good stock of pictures from which to select. They can be put in order so as to tell the "story" of the environment from the stage of natural balance to that of complete deterioration. Human impact could be displayed by scenes of overstocking and excessive tree-felling. Also the socio-economic consequences can be easily shown in pictures. The production of such visual-aids should take various target-groups into consideration. IPAL should not be engaged in mass-production of educational aids; it should function only as an author and not as a publisher. Test studies are allowed.

4. Teaching by demonstration

Teaching by demonstration is the most effective method of teaching. The demonstration should be easy to copy by the population needing little external input. IPAL has already conducted some demonstrations, such as using bamboo sticks to build kraals and conserving

plots of pastures. It is to be recommended that the demonstration should show economic ways of using firewood. One could easily convince women of such economic methods if one carried out a simple experiment by putting two pots of water of equal size and content, one on an open fire and the other on a closed mud oven. By comparing the amount of wood used to make the water in each of the pots start boiling, it will become clear that about ten times as much wood is consumed by an open fire. The information given at the UN Conference on New and Renewable Sources of Energy in Nairobi in 1981 reveals that open fires use only 40% of the generated energy. This makes the correlation 1 : 10.

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